PROPOSED PLAN

OU3 – MADWIDE RESIDENTIAL

at

MADISON COUNTY MINES SUPERFUND SITE

in

MADISON COUNTY, MISSOURI

Prepared by:

U. S. Environmental Protection Agency
Region 7
11201 Renner Road
Lenexa, Kansas 66219

July 2014

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PURPOSE OF THIS PROPOSED PLAN

This Proposed Plan for the Madison County Mines Superfund Site (Site) is intended to inform and solicit the views of the affected community regarding the U.S. Environmental Protection Agency's Preferred Remedial Alternative to address lead soil contamination at residential yards and public areas across Madison County and southern St. Francois County. A Proposed Plan fulfills public participation requirements under Section 117(a), 42 U.S.C. § 9617 of the Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA), as amended, and Section 300.430(f)(2) of the National Contingency Plan (NCP), 40 CFR § 300.430(f)(2). The purpose of this Proposed Plan is to:

- provide basic background information about the Site,
- identify the Preferred Alternative for remedial action at the Site and explain the reasons for the EPA's preference,
- describe the other remedial options considered,
- solicit public review of and comment on all alternatives described, and
- provide information on how the public can be involved in the remedy selection process.

The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identity number is MOD098633415. Currently, CERCLIS is being replaced with a new tracking and information system called Primavera. Information in the CERCLIS system is currently unavailable for access and full migration to Primavera remains in process.

This Proposed Plan highlights key information from the Remedial Investigation (RI), Baseline Human Health Risk Assessment (HHRA) and Focused Feasibility Study (FS) for Operable Unit 3 (OU3). These and other documents are available for additional information regarding the proposed remedial action in the Site Administrative Record (AR) located at the local Ozark Regional Library or the EPA Regional Office in Lenexa, Kansas, at the addresses listed below:

Ozark Regional Library - Fredericktown Branch
115 South Main Street
Fredericktown, Missouri 63645
Hours: Monday, Wednesday, Friday (10:00 a.m. – 5:30 p.m.)
Tuesday (10:00 a.m. – 8:00 p.m.)
Saturday (10:00 a.m. – 3:00 p.m.)

U.S. Environmental Protection Agency, Region 7
Superfund Records Center
11200 Renner Road
Lenexa, Kansas 66219
Hours: Monday – Friday (8:00 a.m. - 5:00 p.m.)

The EPA is interested in receiving public comment on the alternatives evaluated and on the rationale for the Preferred Alternative. New information that the EPA receives during the public comment period

could result in the selection of a final remedy that differs from the Preferred Alternative. A glossary of common Superfund terms is included at the end of this document.

COMMUNITY'S ROLE IN THE SELECTION PROCESS

The EPA relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, an AR containing the HHRA, the RI Report, the Focused FS Report and all other documents supporting this decision has been made available to the public for a 30-day public comment period which begins on July 17, 2014 and concludes on August 17, 2014.

A public meeting will be held on July 17, 2014, at 6:30 p.m. at the Mineral Area College, Fredericktown Outreach Facility located at 1450 Madison 517, Fredericktown, Missouri, 63645, where the EPA will present the Proposed Plan, the Preferred Alternative and receive public comments, both verbal and written.

Comments received at the public meeting, as well as written comments submitted during the comment period, will be addressed in the Responsiveness Summary section of the Final Record of Decision (ROD), the document which formalizes the selection of the remedy.

All written or verbal comments should be addressed to:

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Office of Public Information
U.S. Environmental Protection Agency, Region 7
11201 Renner Road
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SITE BACKGROUND AND HISTORY

The Site is located in Madison County and southern St. Francois County, approximately 80 miles south of St. Louis, in southeastern Missouri at the southern end of the Old Lead Belt, where heavy metal mining has occurred since the early 1700s and industrial mining activities since the 1800s. The Site consists of all areas that have been impacted by past mining practices and the migration of the resulting mine waste.

Lead ore was discovered in the area of Mine La Motte north of Fredericktown by French explorers around 1715. The area was already known to and likely was being exploited by local natives. Mining commenced in the early 1720s and continued intermittently on a comparatively small basis through the 18th century. Mining and beneficiation activities increased significantly at Mine La Motte and what is now known as the Madison Mine beginning in the mid-1840s and expanded throughout Madison County in the period following the Civil War. Most of the smaller mines located around the county were operated at this time. Mining in Madison County has produced copper, lead, cobalt, nickel, iron and small amounts of zinc, silver and tungsten.

Past mining operations have left at least 13 identified major areas of mine waste in the form of tailings and chat deposits from significant mineral processing operations and smelting in Madison County (Figure 1). Chat deposits include sand- to gravel-sized material resulting from the crushing, grinding and dry separation of the ore material. Tailings deposits include sand- and silt-sized material resulting from the wet washing or flotation separation of the ore material. The mine waste contains elevated levels of lead and other heavy metals which pose a threat to human health and the environment. These deposits may have contaminated soils, sediments, surface water and groundwater. These materials also may have been transported by wind and water erosion or manually relocated to other areas throughout the county. It has been reported that mine waste may have been used on residential properties for fill material and private driveways, used as aggregate for road construction and placed on public roads around Fredericktown to control snow and ice in the winter.

This Proposed Plan has been prepared to present the EPA's Preferred Remedial Alternative for OU3-Madwide Residential (OU3), and addresses yard soil at residences at the Site.. It also addresses roadways, right-of-ways and storm water drainages in Fredericktown and its adjoining communities, in addition to groundwater at potable, residential wells. The Site has been divided into seven Operable Units (OUs) to organize the work into logical elements based on similar contaminated media, geographic and demographic features of the Site, and for setting priorities for the work. The seven OUs are described as follows:

- OU1 – Northern Madison County Unit (OU1) is located in northern Madison County and consists of the Mine La Motte Recreation Association (MLMRA) subsite that contains approximately 250 acres of tailings; Slime Pond, a 100-acre lake used by the MLMRA; the Harmony Lake and Harmony Lake tailings; Basler Mines (also known as Copper Mines and Shoemaker Property); the Old Jack Mine; the Lindsey Mine; the Offset Mine; City of Fredericktown Lake; the small gage feeder rail right-of-way to the abandoned Black Mountain spur and abandoned Missouri Pacific right-of-way. All other areas and media affected by these former mining locations are included.

- OU2 - Anschutz Subsite (OU2) consists of all mining and mine works locations and adjoining areas located immediately southeast of Fredericktown. Included are the A, B, C, D and E tailings areas (historically known as the Madison Mine); a metallurgical pond and sediment pond; remnants of an old mill and smelter and associated slag pile; head frame and abandoned shafts; a mine decline; a refinery complex; a remnant chat pile and mine dump; associated groundwater; surface water and sediments in Goose Creek and Tollar Branch Creek; the abandoned Black Mountain spur right-of-way through Fredericktown, and all other mine works locations and outflows affected by these past mining activities.

- OU3 – includes residential yards, public areas, child high use areas, roadways, right-of-ways, storm water drainages and potable groundwater at private wells.

- OU4 - Conrad (OU4) includes a tailings pile and adjoining Ruth mine and mill complex with its mine waste, surface water and sediments affected by the mine waste, eroded materials in the unnamed tributary to Mill Creek with its floodplain and overbank deposits; adjacent road right-of-ways and drainages, mine waste pile wind-blown contamination; groundwater impacts within the mine waste locations; and all other associated mine works locations and outflows. A focused FS and ROD were completed in 2011.

- OU5 - Catherine Mines/Skaggs Piles (OU5) includes the Catherine Mine with its mine waste, pond, repository, Logtown Branch Creek and associated drainages. The Skaggs tailings location includes its mine waste and associated drainages with surface water, sediment, overbank and floodplain deposits along two unnamed tributaries. Also included is the transect of a former overhead tram which transported parent rock from the Skaggs subsite to the Little St. Francis River (LSFR) subsite for processing; the LSFR subsite; and all other associated mine works locations and outflows. A focused FS and ROD were completed in 2012.

- OU6 - Silver Mines (OU6) includes all other known and undiscovered mining-related contaminated areas including but not limited to the Silver Mines area with the Einstein and Apex mines; nearby groundwater, surface waters and sediments in the unnamed runoffs to the Little St. Francis River (LSFR); road right-of-way; public drainage ways; and mine works locations and outflows.

- OU7 – LSFR Watershed (OU7) includes all surface water, floodplain and overbank deposits and sediments in the LSFR watershed that are not specifically addressed under other OUs.

The following changes have been made to the OUs. OU3 has been revised to not include the LSFR tailings since these tailings are present as a result of processing from materials transported from Catherine Mines, and is therefore to be included in OU5. In addition to this, the mine workings, outflows, sediment and surface water in Tolar Branch and Goose Creek, and groundwater associated with these tailings and mine caverns, are to be included with OU2 which is the primary source of contamination for these components.

Starting in 1980, a number of investigations by various organizations were conducted on the county's mine waste and its effects, most of which focused on the areas affected by mine waste within OU2. See Figure 1 for a site map of the mine waste areas within the Site. In order to investigate a broader area, the EPA performed an Expanded Site Inspection (ESI) on the LSFR watershed at the Site in 1995. The ESI attempted to identify potential sources of mine waste in the LSFR watershed, determine the composition of these sources and determine if there had been a release of mining-related contaminants (heavy metals) to media within the LSFR watershed. Geographically, the ESI included OU1, OU2, the Catherine/ Skaggs Piles and Conrad mine waste areas. A limited number of samples were collected from mine waste, groundwater, sediment and soil, and were analyzed for heavy metals. The results indicated elevated concentrations of a number of heavy metals. Additionally, studies conducted by the Missouri Department of Health and Senior Services (MDHSS) and the Madison County Health Department (MCHD) concluded that some children in Madison County possessed elevated levels of lead in their blood.

As a result of the of elevated blood lead levels in children, the presence of mine waste piles in Madison County and previous investigations, the EPA began conducting removal assessment activities, focusing on lead-contaminated surface soil in residential yards and other public areas frequented by children. The removal assessment consisted of obtaining access to residential yards or public areas; documenting current property conditions; collecting surface soil throughout the property; and analyzing the samples for metals with a portable X-Ray Fluorescence (XRF) instrument. The EPA started assessing lead-contaminated soil in the Harmony Lake area in 2000 and shifted the assessment to Fredericktown starting in 2002. At that time, the EPA expanded its lead-contaminated soil assessment to include all residential properties.

Because assessment results in the Harmony Lake area indicated children's health was at risk due to lead levels in residential surface soil, an Action Memorandum was signed by the EPA on September 8, 2000, outlining the rationale for implementing a removal action in the Harmony Lake area. The removal action consisted of excavating the soil in areas with elevated lead concentrations up to one foot below ground surface (bgs) and two feet bgs in garden areas, and replacing it with clean soil. Additionally, the approximately 30-acre Harmony Lake tailings pile was covered with one foot of soil to stabilize the mine waste and minimize its impact on human health and the environment.

In 2002, at the request of the MCHD, the EPA tested mine waste recently brought in to be used as fill at a farm supply company in Fredericktown. Upon confirming elevated concentrations of metals, particularly lead, in the mine waste fill at the property and upon confirming at least one child living nearby with an elevated blood lead level (greater than 10 micrograms per deciliter [µg/dL]), the EPA signed two Action Memoranda authorizing two removal actions. The first removal action, conducted by the farm supply company under a Unilateral Administrative Order, included removing all mine waste and contaminated soil with lead concentrations greater than 400 parts per million (ppm) from the farm supply property and redepositing it at its original location, currently called the LSFR subsite. In some locations on the property, clean fill material was brought in to raise the grade.

A second Action Memorandum was signed in September 2002 to minimize human exposure to lead-contaminated soil in sensitive population areas (such as daycare centers, public parks, other public recreational facilities and homes with potentially lead-impacted children) in the Fredericktown area. Similar to the Harmony Lake removal action, the Fredericktown removal action (started in 2003) consisted of excavating the soil in areas with elevated lead concentrations up to one foot bgs and two feet bgs in garden areas and replacing it with clean soil. In 2004, another removal action very similar to the Fredericktown removal was initiated to address a number of residential properties within OU1 in the northern part of Madison County. By the completion of the removal actions in October 2006, approximately 813 residential properties, which included daycare centers, schools, churches and trailer parks had been remediated. The removal resulted in the excavation and replacement of approximately 205,000 cubic yards (yd^3) of lead-contaminated soil. Contaminated soil was transported from the residential properties to the Catherine Mines repository.

As part of the removal assessment, the EPA also collected and analyzed surface water and sediment samples across the Site. The results of this sampling indicated various heavy metals at concentrations greater than their respective background concentrations. Surface water samples contained iron, lead, nickel, aluminum, copper and silver concentrations exceeding the MDNR aquatic life standards. As a result of the elevated levels of heavy metals present, the Site was placed on the National Priorities List on September 29, 2003. The RI report and FS report was issued in April 2008, both of which are included in the AR.

An Interim ROD (IROD) for OU3 was signed in 2008 and construction began to remediate residential properties in early 2009. The remedial action at residential properties remains ongoing. To date, including both the removal and remedial actions, over 4,200 residential properties have been sampled and 880 residential properties have been remediated with an estimated 447,000 cubic yards of contaminated soil and mine waste removed. Approximately 10% of the soil samples collected were submitted for laboratory confirmation and for XRF correlation.

RODs were completed for OU4 and OU5 in 2011 and 2012 respectively. RODs for the other OUs will be issued in the future.

This Proposed Plan presents the preferred Remedial Alternative for the Final OU3 ROD to complete the remaining residential properties not included under the IROD. It is intended to be the final decision document for residential properties which includes yards, public areas, child high use areas, and also includes unimproved roadways, right-of-ways, storm water drainages and potable water at private wells in the halo of mine workings, tailings and outflows.

SITE CHARACTERISTICS

Since mining operations have ended in Madison County, the primary land use is agriculture crop and pasture land. Industrial activities consist of light manufacturing, aggregate production and construction. The population is predominantly rural. Based on U.S. Census 2010 data and 2013 estimates, the population of Madison County is 12,431 including 4,783 households and 5,917 housing units. In addition, the county has approximately 260 nonfarm businesses, 6 schools, 400 farms, 300 miles of unimproved rural roads, 100 miles of paved rural roads, 1 major river, 1 secondary river and 1 water supply district. The city of Fredericktown draws its water supply from the LSFR. The Madison County Public Water Supply District (PWSD) provides water to rural customers from wells located north and south of Fredericktown, and local residents not served by the City of Fredericktown are supplied by their own private wells. There are an estimated 2,000 private wells at the Site.

Madison County is subdivided into the St. Francois Mountains on the western side of the county and the Salem Plateau on the eastern side of the county. Topographically, the St. Francois Mountains comprise a geologically mature landscape with rounded ridges and meandering streams that occupy comparatively wide valleys. In a few locations, rivers and streams cut across ridges, forming steep canyons.

Much of the Site is underlain by Paleozoic (Cambrian) sedimentary rocks that rest on Precambrian crystalline rocks or basement complex which form the St. Francois Mountains. The sedimentary formations vary in thickness, and locally thin out or "pinch out" against structural highs of the basement complex (St. Francois Mountains). The rock formations present in the area include the following, from the Precambrian basement up: (1) the Lamotte Sandstone; (2) the Bonneterre Dolomite; (3) the Davis Formation; and (4) the Derby-Doe Run Dolomite. Soils formed from these formations are predominantly clays with comparatively low permeabilities. Soil profiles and horizons are generally well developed.

Most lead mineralization in the Madison County area occurs within the lower part of the Bonneterre Dolomite on the flanks of buried or exposed Precambrian topographic highs, generally within a few hundred feet of the boundary where the underlying Lamotte Sandstone pinches out. Lead ore, primarily in the mineral galena, and other metallic minerals occur as deposits that have replaced dolomite crystals in portions of the Bonneterre Dolomite. The ore occurs in horizontal sheets along bedding planes, cavity fillings and linings on the walls of joints and fractures. The deposits extend laterally for hundreds of feet and may extend 200 feet vertically. However, mineralization in the Silver Mines area is distinct, consisting of quartz veins in the Precambrian basement complex that contain galena, wolframite (iron tungstate) and additional sulfide minerals as primary ore phases for additional metals such as tungsten and silver.

Mine waste left at the Site contains elevated levels of lead and other heavy metals which pose a threat to human health and the environment. The chat and tailings deposits have resulted in contamination of soil, sediment, surface water and groundwater. These materials have been transported by water erosion and, to a lesser degree, wind erosion, and manually relocated to other areas throughout the county. Mine waste and the offsetting contamination to soil was transported to residential properties for use as fill and

grading material, aggregate for driveways and road construction and placed on public roads for traction control in and around Fredericktown as needed in the winter.

Groundwater hydrology is poorly understood in the Madison County area but has been described as occurring both within unconsolidated overburden soils and bedrock. Groundwater within the overburden materials is less abundant than in the bedrock due to the generally low permeability and thin character of the local soils. Two main aquifers are identified in the area: the Bonneterre Transition Zone and the Davis Formation/Whetstone Creek member. These two aquifers are separated by the Lower Bonneterre Formation which serves as an aquitard or confining bed that impedes the exchange of water between the two aquifers.

The Bonneterre Transition Zone is mudstone that grades downward into dolomitic sand. The sand has an estimated hydraulic conductivity on the order of 3.1 feet per day. The Whetstone Creek Member is a medium- to coarse-grained crystalline dolomite with interbedded gray and green shales. This unit is locally a major source of groundwater and is considered to be a more significant water-bearing unit in the area due to its higher hydraulic conductivity estimated at 11 feet per day. Groundwater flow within the region is poorly defined, but under natural or undisturbed conditions is projected to follow the overall topographic gradients. Flow within both unconsolidated overburden and bedrock is expected to be from upland areas to lower topographic areas such as along the major drainage courses. Mine workings, including open and collapsed stopes, tunnels and rooms, are expected to locally alter groundwater flow. Rates of groundwater flow are unknown but expected to be potentially high based on the aggregate pumping required to dewater the Madison Mine workings, being on the order of 1,000 to 1,500 gallons per minute. Consequently, most of the lead mines within the Bonneterre Formation are expected to be at least partly flooded. Mine workings associated with the Silver Mines area are also expected to be partly flooded based on observations of drainage emanating from some adits.

Many private, potable wells are scattered throughout the Site located in and around former mining areas. Potable wells in locations where mining has not occurred may also encounter subsurface strata sharing the same naturally occurring metals targeted by the mining industry. Groundwater at the Site is predominantly alkaline in nature, attributed mostly to the presence of sedimentary dolomite and limestone. In general, the alkalinity of groundwater provides a buffering effect that restricts the dissolution of metals. This has historically been attributed as a major reason for the limited presence of groundwater contamination at the Site.

When considering potential leaching of chemicals of concern (COCs) from contaminated soil as a source of groundwater contamination at residential properties, no soils excavated from residential properties and analyzed using the Toxic Characteristic Leaching Procedure (TCLP) method have failed. This supports the suggestion that leaching of COCs to groundwater from contaminated soils outside mine workings and tailings locations is unlikely. However, groundwater sampled during the RI did reveal elevated concentrations of lead and other COCs within the tailings deposits.

SCOPE AND ROLE OF THE RESPONSE ACTION

The Final OU3 ROD will address contamination at residential properties that are not included in the IROD estimates which includes yards, public areas, child high use areas, unimproved roadways, right of ways, storm water drainages and potable groundwater at private wells. The remaining actions for the other OUs will be addressed by future Proposed Plans.

Removal actions have resulted in the cleanup of approximately 813 properties and were concluded in 2006. During the development of the IROD, 1,100 properties were projected to remain in need of remedial action, with remedial action under the IROD remediating approximately 880 of these properties. Soil sampling for residential properties initiated as part of removal actions and continued through the remedial actions remains ongoing with at least two attempts by the EPA, its contractors and the MCHD to secure access for sampling. Access to sample and remediate continues to present an agency challenge. Costly and exhaustive efforts to physically visit these properties, to meet with the property owners face to face, has yielded only a small fraction of access agreements to sample the remaining properties.

There are approximately 283 properties already confirmed eligible for remediation under the IROD with approximately 30 percent of the property owners having denied access for remediation during the last remedial action. The historic average for properties exceeding 400 ppm lead, based on all properties currently sampled, is approximately 40 percent. Therefore, considering the properties known to possess contamination above the cleanup level and a rough estimate of properties remaining to be sampled ranging from 600 to 800 properties, it is estimated that as many as 300 properties will require remediation under the Selected Remedy for the final ROD.

The 400 ppm lead cleanup level is based on the site-specific Human Health Risk Assessment (HHRA) described in the next section and assumes lead is measured in the bulk soil sample with an XRF instrument. As shown on Figures 2 and 3, the properties already identified for cleanup and those remaining to be sampled are scattered across the Site.

Private wells drilled in Missouri were not required to be registered until after November 1, 1987. Currently, there are 1,013 domestic wells and one multi-family well registered in Madison County. An additional survey needs to be conducted at the Site to determine the precise number of potable, residential wells since not all private wells are registered.

The EPA collected groundwater samples from 45 private wells across the Site during the RI for use in calculating human health risks for groundwater. Risk calculations from the 45 private wells sampled by the EPA are detailed in the HHRA described in the next section. In addition to the EPA's sampling, the MCHD has sampled 410 private wells since 2000. Nine wells, or 2 percent of all wells sampled by the MCHD, exceeded the lead MCL of 0.015 milligrams per liter (mg/L), or parts per million (ppm). Although the data from these wells was not included in the risk calculation, these results are considered consistent with those collected by the EPA.

Based on the results of the combined groundwater sampling efforts at potable wells, it is projected that an estimated of 40-60 potable wells will need to be sampled within the halo of mine waste, mine workings and outfall locations, and at least 15 potable wells resampled. It is estimated that approximately 30 wells will exceed the MCL for one or more COCs based on past sample results. Evaluations for potable wells, including but not limited to location, the types and phases of COCs detected, and the condition of the well and distribution system will be required to determine a necessary corrective action that will reduce the level of contamination to within safe drinking water standards for the COC(s) exceeding their respective action level.

This Proposed Plan presents the Preferred Remedial Alternative for the Final OU3 ROD. The projected timeframe to complete sampling and remediation of the remaining residential properties is two years. OU3 addresses the highest priority of the site, which is the human health risk, posed by lead contamination in residential property soils. The remedial alternatives in this Proposed Plan are similar to

those presented in the 2008 OU3 IROD, but also include the balance of the other OU3 components referenced in the IROD to include roadways, right-of-ways and storm water drainages, groundwater at private wells used for potable water, and institutional controls (ICs) which includes the full implementation of the Voluntary Institutional Controls Project (VICP).

SUMMARY OF SITE HUMAN HEALTH RISKS

A baseline HHRA was conducted for the Site to assess the potential risks to humans, both now and in the future, from site-related contaminants present in environmental media including surface soil, indoor dust, sediment, surface water and drinking water at private wells. The HHRA assumes that no steps are taken to remediate the environment or to reduce human contact with contaminated environmental media. The results of the risk assessment are intended to help inform risk managers and the public about potential human health risks attributable to site-related contaminants and to help determine if there is a need for action at the Site.

In the HHRA, lead was identified in the risk assessment as the primary COC. Other substances and metals such as aluminum, antimony, arsenic, chromium, iron, manganese, nickel, thallium and vanadium in soil and fluoride in groundwater were identified in various media and locations as COCs in select situations and, on a more limited basis, manganese, cadmium, chromium, cobalt and zinc. The risk assessment summary in this Proposed Plan focuses on lead since it is generally the primary COC in a residential property setting in this lead mining area and has been confirmed to exist in high concentrations at nearly every location when other COCs are present in elevated concentrations. For further information, please refer to the HHRA in the AR.

Young children (typically defined as seven years of age or younger) across Madison County are the most sensitive population group potentially exposed to lead contamination at the Site. Young children are most susceptible to lead exposure because they have higher contact rates with soil or dust, absorb lead more readily than adults and are more sensitive to the adverse effects of lead than are older children and adults. The effect of greatest concern in children is impairment of the nervous system, including learning deficits, lowered intelligence and adverse effects on behavior.

The risks or potential for adverse health effects from exposure to lead are evaluated using a different approach than for most other metals. Because lead is widespread in the environment, exposure can occur by many different pathways. Thus, lead risks are based on consideration of total exposure (all pathways) rather than just site-related exposure. In addition, because most studies of lead exposures and the resulting health effects in humans have traditionally been described in terms of blood lead level (expressed in micrograms per deciliter, or µg/dL), lead exposures and risks are typically assessed using mathematical models.

The risk assessment for the Site used the EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children to estimate the distribution of blood lead levels in a population of residential children exposed to lead. Typically, the focus of a risk assessment with respect to lead in a residential setting is on children since they are a more sensitive population than older children or adults. Thus, the IEUBK model was used to evaluate the risks posed to young children (6 to 84 months) as a result of the lead contamination at the Site.

The IEUBK model uses site-specific and default inputs (i.e., soil concentration, indoor dust concentration, bioavailability, etc.) to estimate the probability that a child's blood lead level might exceed 10 µg/dL. For a residential child, the IEUBK model was run using available site-specific data,

including lead concentrations in residential property soil, indoor dust and groundwater. In addition, testing was performed to estimate the relative bioavailability or the amount of lead absorbed into the body following incidental ingestion of soil. The results indicate that uptake of lead at the Site is greater than the IEUBK model default value.

The EPA's health protection goal is that there should be no more than a 5% chance of exceeding a blood lead level of 10 µg/dL in a given child or group of similarly-exposed children. The basis for this goal is that the Centers for Disease Control and Prevention (CDC) and the EPA have conducted analyses demonstrating health effects at or below a blood lead level of 10 µg/dL. Although the CDC has reduced its lead reference value level of concern to 5 ug/dL based on the 97th percentile blood lead level in children ages of 1 and 5, this has not resulted in the EPA adjusting its health protection goal accordingly, so the original health protection goal remains valid.

Risk Estimates for Residents from Soil

A total of 970 residential properties were evaluated and used for the HHRA. Children residing at 171 properties (18%) were predicted to have greater than a 5% chance of exceeding a blood lead level of 10 µg/dL. Children in the remaining 799 homes (82%) were predicted to have blood lead levels at or below the EPA's health protection goal. The risk assessment results indicate that a child exposed to residential property lead soil concentrations above 400 ppm would have greater than a 5% chance of exceeding a blood lead level of 10 µg/dL.

The 400 ppm lead action level is based upon sieving the soil sample with a #10 mesh sieve to obtain particles less than 2 millimeters (i.e., the bulk soil fraction) and analyzing the sample with an XRF instrument. These results indicate that a number of homes at the Site which have not been remediated remain a potential health concern with regard to lead.

The HHRA also determined that soil at several residential properties may present a non-cancer risk to children from a number of heavy metals, excluding lead, at the maximum sample concentration. It is important to note that if these risks were based on average heavy metal concentrations in soil, the residential property soils would not exceed a level of concern for children. Through confirmation sampling of soil at both remediated and unremediated properties during the IROD response actions, it was determined that other COC metals originally identified are overwhelmingly co-located with lead. Additionally, the response actions resulted in a minimum of 12 inches of clean soil placed at the surface, and demarcation barrier underlying the clean soil if the remaining contamination exceeded 1,200 ppm lead. Confirmation testing of residential soils at an EPA lab was conducted on approximately 10 percent of the properties sampled to confirm the quality of data obtained from XRF testing. The results, which include analytical data for most of the other site related metals in addition to lead, concludes that when lead is reduced to concentrations below 400 ppm, other site related metals are similarly reduced to acceptable levels.

Risk Estimates for Residents from Groundwater

The EPA collected and analyzed groundwater from 45 private wells scattered across the Site for use in calculating human risk of exposure to COCs in groundwater with only two wells exceeding the MCLs for lead. However, upon retesting these wells, they did not exceed the 0.015 mg/L Maximum Contamination Limit (MCL). Exposure concentrations of lead in groundwater do not result in predicted blood lead levels exceeding the EPA's health-based goal for current child residents.

Exposure concentrations of lead in groundwater do not result in predicted blood lead levels exceeding the EPA's health-based goal for current child residents at most locations, with the exception of two wells located in Fredericktown. It should be noted that subsequent resampling of these potable wells yielded lead concentrations below the lead Maximum Contaminant Level of 0.015 mg/L.
When considering leaching of COCs from contaminated soil as a source of contamination, no soils excavated at residential properties are known to have failed the Toxic Characteristic Leaching Procedure (TCLP) analyses. This suggests that leaching of COCs to groundwater, from contaminated soils at residential properties to private wells, is rare. Conversely, groundwater sampled within the tailings deposits during the RI revealed, in many cases, elevated concentrations of lead and other COCs resulting in leaching to groundwater at some source locations.

The HHRA determined that exposure to concentrations of lead in groundwater at potable wells does not result in predicted blood lead levels exceeding the EPA's health-based goal for current child residents at most locations. However, if shallow groundwater within the mine waste areas was actually used for drinking by future residents, lead groundwater concentrations would result in greater than a 5% probability of a child's blood lead level exceeding 10 µg/dL, thus not meeting the EPA's health-based goal at most locations. The exception is potential shallow wells located near the Silver Mines area.

With regard to other COCs, there does not appear to be a non-cancer risk to the majority of current child and adult residents from ingestion of groundwater from private water wells, although there are some risks for current residents at a number of wells. In most cases, this risk is associated with elevated levels of fluoride with additional contributions from manganese and iron. High background concentrations of iron and manganese have been routinely detected at the site in areas unaffected by past mining activities, observed in results from backfill and topsoil testing during remediation. Similarly, elevated fluoride has been detected in groundwater samples from private wells by the MCHD in northwest Madison County where no mining has occurred, and is considered to be naturally occurring, elevated background concentrations in groundwater.

Based on the available data, the low incidence of groundwater contamination at private wells suggests that contaminated soil at residential properties outside of mine waste locations does not appear to be a likely contributor to groundwater contamination at the Site. However, to account for any possible contamination of groundwater at private wells in and around mine workings, waste source locations and outflows, private wells used for potable water in the halos of these contamination sources will be addressed.

Groundwater would be sampled to determine the COC concentration with respect to its MCL and contaminant phase (dissolved or suspended solids). To the extent possible, the precise cause of contamination will be evaluated. Based on the findings, corrective options could include filtering, treatment, well repair or replacement, or provision of or connection to an alternate water supply to provide potable water that meets the EPA's safe drinking water standards.

Summation

Final cleanup levels for lead in residential property soil at most Superfund sites are generally based on the IEUBK model results and the nine criteria analysis included in this Proposed Plan in accordance with the NCP. The EPA usually selects a residential soil cleanup level within the range of 400 ppm to 1,200 ppm for lead. As described above, the IEUBK modeling results for the Site recommend a lead soil concentration of 400 ppm to ensure that a child has less than a 5% probability of having a blood lead level exceeding 10 µg/dL.

This Proposed Plan only addresses human health risk at residential properties and the other stated OU3 components within the targeted boundary of the residential properties, as indicated in the Superfund Lead-Contaminated Residential Sites Handbook. Therefore, while an Ecological Risk Assessment was completed for the Site, a summary of it is not included in this Proposed Plan.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) consist of quantitative goals for reducing human health and environmental risks and/or meeting established regulatory requirements at Superfund sites. RAOs are identified by reviewing site characterization data, risk assessments, applicable or relevant and appropriate requirements (ARARs), and other relevant site information.

Based on current site data and evaluations of potential risk, lead was identified as being a COC. The primary cause of human health risk from residential property soils at the Site is through direct ingestion (by mouth). Thus, the RAO for the residential property soils at the Site is to:

Reduce the risk of exposure of young children (children under seven years old) to lead such that an individual child or group of similarly exposed children have no greater than a 5% chance of exceeding a blood lead level of 10 µg/dL.

Based on site-specific information, the EPA's IEUBK model predicts that a young child residing at the Site will have greater than a 5% chance of having a blood lead level exceeding 10 µg/dL if the lead soil concentrations to which he or she is exposed are above 400 ppm under the assumed exposure conditions. Thus, 400 ppm lead in soil will be the cleanup level of the remedial action as measured in the bulk soil fraction using an XRF instrument.

The RAO for potable water at private wells is to reduce or eliminate COCs present as a result of mine waste contamination to meet the EPA's drinking water standards to within its respective MCL, Secondary MCL and/or Action Level. This would include private well sampling, evaluation and one or a combination of the following corrective actions: treatment, filtering, well repair, well replacement or connection to an alternate source.

Health education would be continued to educate the community on the dangers of lead contamination, exposure prevention and the importance to human health.

ICs would include the full implementation of the VICP described in greater detail under the Remedial Alternatives and Attachment A.

REMEDIAL ALTERNATIVES CONSIDERED

Remedial Alternative 2 outlined herein and later evaluated is the EPA's Preferred Alternative. Each alternative is presented in much greater detail in the original Focused FS Report and FS Addendum. All elements of the two alternatives considered are common. The remedial alternatives developed to address the RAO previously identified in this Proposed Plan for the Site are presented below.

Alternative 1: No Action
Estimated Total Capital Cost: $0
Estimated Annual O&M Cost Range: $0
Estimated Present Worth Cost: $0
Estimated Construction Time Frame: N/A
Estimated Time to Achieve RAO: Indeterminate

The NCP requires that the EPA consider a no-action alternative against which other remedial alternatives can be compared. Under this alternative, no further action would be taken to monitor, control or remediate the threat of lead in residential property soil at the Site. Alternative 1 would not meet the RAO because it does not minimize or eliminate the existing or future potential exposure to lead contamination.

Alternative 2: Excavation, Disposal, Vegetative Cover, Potable Water Corrective Action, Health Education and Institutional Controls
Estimated Total Capital Cost: $9.8 million
Estimated Annual O&M Cost Range: $140,000
Estimated Present Worth Cost: $8.3 million
Estimated Construction Time Frame: 2 years
Estimated Time to Achieve RAO: 4 years

Under this alternative, the definition of a residential property includes residential yards, public areas and child high use areas. Included with the remediation of a residential property are unimproved roadways, right of ways and storm water drainages. The EPA would continue to seek access to and complete sampling of the remaining residential properties that have not been sampled to determine the presence of lead contamination. It is currently estimated that 750 properties would remain to be sampled under this action to determine eligibility for remediation, with an estimated 300 properties requiring remediation. If access cannot be gained from property owners to sample or remediate, administrative action may be used as a vehicle to gain access.

A residential property with at least one quadrant testing greater than 400 ppm lead would be remediated. If the remaining drip zone of that property exceeds 400 ppm lead, the drip zone would also be remediated. A residential property with no quadrant exceeding 400 ppm lead would not be remediated under this action.

Remediation under this alternative would include the excavation and disposal of lead-contaminated soil, backfilling the excavation with clean soil, and restoration of the disturbed area of the property to its original condition. Soil would be excavated using acceptably sized equipment suited to the size of the property and for accommodating its ability to access and work within the property boundaries. Hand tools would be used in areas where access is constrained and to prevent damage to buried utilities, tree roots, plantings, landscaping and other structures. Excavation would continue beneath the ground surface until the underlying soils at the base of the excavation are less than 400 ppm lead, or to a minimum depth of 12 inches if less than 400 ppm cannot be achieved. An exception is garden areas, where the maximum depth of excavation could be 24 inches bgs if 400 ppm cannot be achieved.

If at 12 inches bgs the lead soil concentration is greater than 1,200 ppm, the EPA would approve excavation to a greater depth if it could be determined that a lead soil concentration below 1,200 ppm could be achieved within 24 inches bgs. If the EPA determines a lead concentration of less than 1,200 ppm concentration cannot be achieved within 24 inches bgs, a demarcation barrier would be placed

beneath the clean soil at a minimum depth of 12 inches bgs. The demarcation barrier would be an obvious, highly visible, plastic barrier that is permeable, wide meshed and will not affect soil hydrology or vegetation, such as an orange or red mesh plastic netting or construction fence.

The demarcation barrier will serve as a physical alert to anyone accessing the subsurface that the underlying soil is contaminated, poses a human health risk and should not be disturbed. The EPA recommends a minimum of 12 inches of clean soil be maintained at the surface to indefinitely serve as an adequate soil barrier to underlying soil that exceeds 400 ppm lead for protection of human health. The rationale for establishing this as a minimum thickness is that the top 12 inches of soil is considered available for direct human contact.

Based on the EPA's previous soil removal activities in and around Fredericktown, an average residential property will require removal and replacement of approximately 186 yd^3 of soil. Although this estimate could be considered high based on the 75 properties with only small areas of contamination identified along streets and in garden areas, the conservative approach is to calculate the property contaminated soil volume based on historic averages, since additional contamination could be identified during the excavation of any given residential property. Considering this, an estimated total of approximately 55,800 yd^3 of soil would require excavation, disposal and replacement. This estimate is used as the basis for part of the cost estimate for this remedial action.

The Conrad Repository would initially be used for the disposal of excavated soils. An additional repository is currently being considered for development. The new repository would serve as a convenient and economical location for the public within the Site boundaries to dispose of contaminated soil encountered during home construction projects, city and county improvement projects, and possibly new developments. For contaminated soil or other mine waste determined to fail TCLP, a stabilization component such as phosphate may need to be mixed with it for acceptable disposal at any approved disposal location.

After excavation and soil disposal, backfill and topsoil would be placed and the property graded to its original condition. The property would then be hydroseeded and/or sodded to restore the vegetation. Hydroseeding is preferred over sodding for its ease of initial maintenance and significant cost reduction. However, sod may be used at some or all locations on a property depending on specific property conditions such as steep slopes that would be subject to erosion before the vegetation could become established, or during periods outside of seeding windows to accommodate use of the yard.

Due to the environmental problems associated with lead and other metals, in addition to the fact that lead contamination to some degree will always remain present at known or undisclosed locations at the Site, continued health education is necessary to assist in preventing activities that could result in human exposure leading to adverse health effects, and to maintain the already reduced frequency of elevated blood lead levels accomplished through the response actions. Under this alternative, the established and active health education program would continue in cooperation with the EPA, ATSDR, MDNR, MDHSS and MCHD. Education would primarily be conducted by the MCHD. The following, although not an exhaustive list, indicates the types of education activities that would be continued at the Site:

- conduct extensive community-wide blood-lead monitoring,
- perform in-home assessments for children identified with elevated blood lead levels,
- distributing prevention information and literature,
- hold meetings with and act as a resource for area physicians of local families,

- provide community education through meetings; literature; talks and presentations at civic clubs, schools, nurseries, pre-schools, churches, fairs, etc.; and one-on-one family assistance,
- undertake special projects to increase awareness of how local citizens can protect themselves from heavy metal health risks, and
- contractor, local government and stakeholder training to educate on issues including lead exposure prevention, proper handling and disposal.

Institutional controls are necessary to maintain the protectiveness of the remedy, both during the remedial actions and indefinitely. The EPA would need to ensure that the clean soil barriers and demarcation barriers are maintained, and the soil beneath the barriers is not disturbed. If disturbance to a barrier cannot be avoided, barrier repair or replacement and proper handling of contaminated soil would be necessary to prevent recontamination at the surface. The EPA has historically looked to various types of ICs as proprietary controls to ensure long-term protectiveness of a remedy.

While the EPA has considered proprietary controls in the form of restrictive covenants, these controls present a greater difficulty at this Site given the large number of residential properties in the project area that have been remediated and the number of properties that possess demarcation barriers with contamination remaining beneath them. Additionally, Madison County is a state-designated "Class 3" county as a result of its assessed valuation and population, which limits its authority to develop ordinances and impose taxes to administer and maintain local controls. For these reasons, a Voluntary IC Program (VICP) has been developed during the IROD remedial activities in conjunction with concerned citizens and government stakeholders for a local program to be operated by the MCHD. Currently funded through cooperative agreements by the EPA to the MDHSS, this program focuses on monitoring and testing residential properties, preventing disturbances to soil/demarcation barriers and contaminated soil, ensuring that proper handling and disposal of contaminated soil if a disturbance occurs, and proper disposal of contaminated soil is accomplished. A VICP Manual (Attachment A) has been developed for use by all stakeholders as a guide to encountering, handling and disposing of lead contamination.

The MCHD has been provided access to the EPA's Residential Lead Database to assist in monitoring properties and maintaining the VICP, in addition to keeping the database content current with respect to property owner information and contact information. The MCHD would alert citizens and contractors of contaminated soil conditions at residences that warrant special attention by monitoring the Missouri Dig-Rite database, which could trigger an oversight response at any project involving soil disturbances. The MCHD has acquired an XRF to analyze soil to determine the presence of contamination and provide proper handling and disposal information, to ensure a property is not recontaminated and that it remains protective of human health.

The ICs would also incorporate training of local governments to garner their cooperation in monitoring construction and repair activities for roads, right-of-ways, storm water drainages, and infrastructure projects to ensure contamination is appropriately handled and disposed. Considering nearly 80% of the roadways, right-of-ways and storm water drainages possess contamination in excess of 400 ppm lead based on prior assessments, the VICP will be implemented to provide for proper handling and disposal of any contaminated material encountered during such projects.

The VICP would be evaluated during the next five year review period to determine its viability and success. If it fails to ensure long term protectiveness, options to continue the ICs could rely on exclusive or combined components that include formal adoption of health ordinances, agreements with local

governments, covenants with property owners through the Missouri Environmental Covenants Act and long term stewardship monitoring.

The current available data from private wells supports that groundwater at residential wells outside of mine waste source locations has not been determined to be a Site concern but will continue to be evaluated by resampling some of the private wells previously sampled by the MCHD. However, groundwater for potable use at private wells in the halo of mine workings, tailings and outflow locations could present a human health risk. Those private wells would be targeted for sampling, and the source and cause for contamination to the potable well water evaluated. Based on the results of the analyses and evaluation, corrective action could include one or a combination of the following to meet the MCLs for COCs: filtering, treatment, well repair, well replacement or providing an alternate water supply through connection to a public water distribution system.

The future land use of the remediated residential properties is not anticipated to change. With adequate remediation, continued health education and successful management of the VICP, the land use would actually be enhanced. Lead-contaminated soil that could otherwise pose a human health risk, would be excavated and clean soil replaced to a minimum depth of 12 inches bgs. Health education would continue to educate school-aged children and the community on the dangers of lead contamination, further reducing exposure risks. The activities implemented under the VICP would assist in protecting clean soil and demarcation barriers in addition to preventing the spread of additional contamination to locations not specifically monitored, all of which will help maintain long term protectiveness of the remedy at the Site.

Alternative 3: Phosphate Stabilization, Excavation, Disposal, Vegetative Cover, Potable Well Corrective Action, Health Education and Institutional Controls

Estimated Total Capital Cost: $13.5 million
Estimated Annual O&M Cost Range: $140,000
Estimated Present Worth Cost: $11.5 million
Estimated Construction Time Frame: 4 years
Estimated Time to Achieve RAO: 4 years

Just as in Alternative 2, under Alternative 3 residential properties with a quadrant showing a quadrant sample result greater than 400 ppm for lead will be remediated. The drip zone may be remediated if the lead concentration in the drip zones of any remediated property exceeds 400 ppm lead. Residential properties where quadrant samples did not exceed 400 ppm lead would not be addressed under this action. Approximately 750 residences in Madison County remain to have their residential property soil sampled by the EPA. Under this alternative, the EPA will continue to seek access to and sample all residential properties within the site to determine if they have been impacted by mining-related activities. If a soil sample for a property quadrant has a lead concentration greater than 400 ppm, the property will be included in the remedial action. Under this alternative, 300 residential properties contain or are expected to contain lead soil concentrations greater than 400 ppm lead and will require remediation.

Under Alternative 3, all residential properties and areas highly accessible to children (i.e., daycare centers, parks, and playgrounds) with lead soil concentrations exceeding 400 ppm but less than 800 ppm (an assumed concentration for costing purposes only) would be treated with phosphate to reduce the bioavailability of metals in the soil, thereby controlling the health risk to children. It is anticipated the

phosphate, in the form of phosphoric acid, would be roto-tilled into the soil to a depth of 6 to 10 inches, and allowed to stabilize for 7 to 10 days. Afterward, lime would be added to the property soil to raise the pH and the lawn would then be reestablished.

This alternative would not be implemented until a site-specific treatability study was completed to assess the effectiveness of phosphate stabilization on reducing lead bioavailability for the Site. The treatability study would consist of initial bench scale and bioavailability testing to determine the effect that phosphate addition, under ideal laboratory conditions, has on Site soils. The second part of the study, assuming initial findings are positive, would include testing of field application methods and phosphate application rates to most effectively lower the bioavailability of lead in the soil. Although site-specific treatability studies are necessary to determine the effect phosphate stabilization has on lowering the bioavailability of lead in residential soils, studies conducted by the EPA at other residential lead sites indicate that phosphate stabilization may be somewhat effective at lowering the bioavailability of lead to young children. The final decision to proceed with phosphate stabilization of properties would be made by the EPA after peer review of the treatability study and public comments on the study.

A long-term monitoring program would be instituted to assess the effectiveness of phosphate stabilization. The program would include soil chemistry monitoring to assess the effects of natural weathering and the long-term stability of the lead-phosphate minerals formed during phosphate treatment.

For residential properties with lead soil concentrations above 800 ppm, the EPA will remediate these properties using a similar methodology as outlined in Alternative 2, namely, excavation, disposal and backfilling. Please see the previous section for details.

Under this alternative, it is estimated that approximately 130 residential properties have lead soil contamination over 800 ppm and so would require excavation. Since an estimated 186 yd^3 of contaminated soil would be removed from each property, an approximate total of 24,100 yd^3 of soil would require excavation, replacement and disposal. The repository, vegetation restoration, health education, ICs that include the VICP, and the groundwater components of Alternative 3 are the same as Alternative 2. Future land use for the Site under Alternative 3 is expected to be similar to Alternative 2.

EVALUATION OF ALTERNATIVES

According to the NCP, nine criteria are used to evaluate the different alternatives individually and against each other in order to select the best remedy. The nine evaluation criteria are (1) overall protection of human health and the environment; (2) compliance with ARARs; (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility or volume of contaminants through treatment; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state support/agency acceptance; and (9) community acceptance. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other alternatives under consideration. The nine evaluation criteria are discussed below.

1. <u>Overall Protection of Human Health and the Environment</u>: Determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

Alternative 1 does not provide protection for the environment or residents at the Site because no actions are taken to mitigate the exposure to lead-contaminated soil. Alternative 2 would remove the significant

exposure pathway associated with contaminated residential property soils. Once excavation, soil replacement and revegetation was complete and the soils were properly disposed, the VICP would be fully implemented to monitor and address risks associated with remaining contamination, and health education would continue to educate citizens and other stakeholders on lead prevention. Potable groundwater at private wells would be assessed and, if determined contaminated above MCLs, would be addressed to reduce contamination to safe drinking water levels. Therefore, Alternative 2 is protective of human health and the environment. As part of Alternative 3, a treatability study using residential property soil would be required to show that phosphate treatment of soil with lead concentrations between 400 ppm and 800 ppm would reduce the bioavailability of lead at the Site to levels that are protective of human health and the environment. Alternative 3 is protective of human health and the environment only if the phosphate treatment significantly reduces the bioavailability of lead on a long-term basis.

Two studies were conducted using phosphate treatment similarly proposed for Alternative 3 as an alternative to address residential soil lead concentration between 400 ppm and 800 ppm. Based on these studies, the EPA is recommending that phosphate treatment no longer be considered as an alternative for the residential cleanup action at the Site. If phosphate treatment were capable of lowering the bioavailability of lead in soil by 50 percent or more, the technology might be appropriate for remediation of properties with lead concentrations of 800 ppm or less. However, if a 50 percent reduction in the bioavailability of lead cannot be consistently achieved, the technology may not be applicable to residential yards with lead contamination less than 800 mg/kg. The application of phosphoric acid to residential soils to reduce the bioavailability of lead has not been implemented on a large scale at residential properties. Some pilot and bench scale studies have demonstrated that phosphate treatment may reduce the bioavailability of lead to some extent, although studies have been inconclusive. The studies do not indicate that the bioavailability of lead can be consistently reduced by 50 percent or more as discussed in the Interim ROD.

In addition, the phosphate treatment may lose its effectiveness over time. If the phosphate treatment does not permanently reduce lead bioavailability, the technology cannot be relied upon to provide long-term protection. The technology has some negative features, such as implementability and public acceptance. During the first 3 to 10 days after the addition of phosphoric acid, the soil will have a low pH near the surface which may pose a risk of irritation or burns to the skin following dermal contact. The phosphoric acid could damage the exterior of the home or personal property around the home if the acid is not carefully applied. The property would have to be fenced prior to the application of the phosphoric acid to restrict access to the property during treatment of the yard. The fence would have to remain until the lime was applied and the yard was sodded. Small animals and birds would still have access to the property, and contact with the soil prior to the application of the lime could pose a risk to them. Depending on the method of applying the phosphoric acid, there would be a risk to workers from aerosol spray. Workers would be required to wear protective clothing, including respiratory protection, during the application of the phosphoric acid. Rototilling the property before the chemical addition and again following each of the two applications of the phosphoric acid could damage shrubs, trees, patios, sidewalks, and driveways on the property if not performed carefully. Rainfall occurring during treatment of the property would have the potential to increase the phosphorous concentration in the storm water runoff. Erosion control techniques would have to be implemented to prevent soil and chemicals from entering the storm water runoff. In addition, some health departments have opposed the use of the technology due to the continued presence of unacceptable lead concentrations in treated soils that would require continued monitoring to measure bioaccessibility, in addition to the soil concentrations, to assure continued protectiveness.

2. Compliance with ARARs: Evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site or whether a waiver is justified.

The ARARs for this Proposed Plan are included in Tables 1 through 6. The no-action Alternative does not comply with ARARs. In contrast, Alternative 2, the excavation portion of Alternative 3, and the groundwater portion of both Alternatives 2 and 3 would comply with chemical and location-specific ARARs. Action-specific federal and state ARARs would be achieved by making sure all soil above the cleanup level is excavated, transported and disposed of properly, and groundwater would meet the conditions for safe drinking water standards with any filters or collection of contaminants properly disposed. Storm water runoff will be addressed to a minimum during excavation, soil replacement, and hydroseeding/sodding using best management practices, thus keeping local streams free of additional sediment. Dust suppression will be used during all phases of construction, and the construction time spent at each residence will be kept to a minimum to minimize exposure to the residents. All precautions will be considered at each location to ensure that excavation will not hinder or interfere with wildlife and local streams. The phosphate treatment portion of Alternative 3 would be dependent on the results of a treatability study to determine if all federal and state ARARs can be met. Please refer to the final paragraph under 1- Overall Protection of Human Health and the Environment.

3. Long-term Effectiveness and Permanence: Considers the ability of an alternative to maintain protection of human health and the environment over time.

Alternative 1 provides no long-term effectiveness or permanence for the protection of human health and the environment. Under Alternative 2 and the excavation portion of Alternative 3, the residual risks (those remaining after implementation) would be significantly reduced. Residential properties within the Site with soil concentrations at or above 400 ppm lead in Alternative 2 and greater than 800 ppm in Alternative 3 would have contaminated soil removed to a depth of 12 inches or greater to meet the lead cleanup level. The removal of contaminated soil, replacement with clean soil, and revegetation ensures that future potential for exposure will be significantly reduced. Alternatives 2 and 3 provide permanence through complete removal and containment of contaminated soils at or above 400 ppm and at or above 800 ppm lead, respectively.

Alternatives 2 and 3 provide the evaluation and selection of a technology to provide safe drinking water. The use of treatment systems and or filters would require maintenance and filter replacement to maintain long-term effectiveness and permanence. Alternatives 2 and 3 would meet this criterion for well repairs, replacement wells or the provision of an alternate source of potable water.

Alternatives 2 and 3 provide a permanent solution for continued health education, in addition to testing, monitoring and guidance of future handling of contamination through the VICP as an IC at a local level. However, some funding to maintain the integrity of these programs may be needed indefinitely.

Previous studies have concluded that phosphate treatment can result in long-term reduction in the bioavailability of lead in soils. However, the treatment of residential soils using a phosphate amendment has not been implemented during a full-scale remediation project. The bench and pilot scale studies that have been performed have had mixed results, although the previous studies have generally indicated that the bioavailability of lead has not been reduced by more than 50%. The long-term effectiveness under Alternative 3 for phosphate treatment of lead concentrations between 400 and 800 ppm would be dependent on the results of a site-specific treatability study.

A significant aspect of Alternative 2 and the excavation portion of Alternative 3 is the placement of the contaminated soils at the Conrad Repository or a future developed repository, both of which require storm water and other design and engineering controls for long-term stability. Additionally, the establishment of a public use repository will be needed indefinitely to ensure long term effectiveness because contamination will always remain on site, and lead at unremediated locations or in locations that were inaccessible during remediation will likely be encountered at some time in the future and require disposal.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment: Evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

There is no reduction in the toxicity, mobility or volume of contamination under the no-action alternative (Alternative 1). Alternative 2 and the excavation portion of Alternative 3 would significantly reduce the mobility of the COCs by consolidation of the contaminated soils at the Conrad Repository or another approved disposal location. Although the exposure pathway would be eliminated or minimized, the toxicity and volume of the material would not be reduced by these alternatives with the exception of the treated and stabilized soils which would otherwise fail TCLP. The toxicity of the stabilized soils would decrease, although the volume of these soils is not expected to be a significant portion of the excavated residential soils. Proper long-term maintenance of the repositories is an important component of Alternatives 2 and 3 to ensure the significant reduction of heavy metal mobility.

The treatment portion of Alternative 3, assuming a site-specific treatability study would confirm phosphate stabilization would reduce the bioavailability of lead to acceptable health-based levels, would reduce the toxicity and mobility of the contamination. The volume of the contamination would not be reduced. However, the amount of soil requiring excavation and disposal would be significantly reduced over Alternative 2 because contaminated soil between 400 and 800 ppm would be treated in place at the residential properties. Please refer to final paragraph under 1- Overall Protection of Human Health and the Environment.

For Alternatives 2 and 3, a reduction to the toxicity of groundwater upon distribution would be accomplished through the use of treatment and filtering. Permanent reduction to the entire source could be accomplished through well repair, well replacement or the provision of an alternate source such as connection to a public water supply.

5. Short-term Effectiveness: Considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

The short-term risk to workers for Alternative 1 is minimal since no remediation efforts will be performed. However, exposure pathways for the public and environment would remain. Alternative 2 has increased short-term risks for the public, environment and construction workers from excavation and transportation efforts. Disturbed contaminated soil could enter the ambient air during excavation and transportation. However, dust suppression would be implemented for the protection of the residents, community and workers during the remedial action. The alternative would require years to implement for all affected residences. However, the length of time at any one residence during excavation would be minimal. Therefore, the residential exposure to dust would be minimal. For Alternatives 2 and 3, the VICP and health education are in progress and short-term exposure risks would be controlled through

continued health education and the full implementation of the VICP. The Conrad Repository is available for disposal of contaminated soil generated by residents, local governments and contractors until a public use repository is developed.

Alternative 3 has the same risks as Alternative 2 in addition to exposing workers, residents and animals to phosphoric acid and lime. Depending on the application method for the phosphoric acid, there would be a risk to workers and property from aerosol spray. Workers would be required to wear protective clothing (including respiratory protection) during the application of the phosphoric acid.

Alternative 1 would not provide for groundwater measures that would be provided by Alternatives 2 and 3. For Alternatives 2 and 3, short term exposure risks could occur during the identification of contaminated groundwater at potable wells, and through delays in providing corrective measures. However, delays in implementing corrective measures could be minimized by providing bottled water until permanent corrective measures are employed.

6. Implementability: Considers the technical and administrative feasibility of implementing the alternative such as relative availability of goods and services.

Alternative 1 does not require any implementation. Alternative 2 and the excavation portion of Alternative 3, in addition to the groundwater portion of Alternative 2 and 3, are readily implementable because they are technically feasible from an engineering perspective. Excavation methods, backfilling and revegetation are typical engineering controls. The installation of groundwater treatment systems or filters, in addition to the drilling of new wells or connection to an alternate water supply, is readily available in terms of equipment and technology. The experience of previous Site removal and remedial actions conducted by the EPA at this and other lead mining Superfund sites has shown that Alternative 2 and the excavation portion of Alternative 3, in addition to the groundwater portion of each, is readily implementable.

The phosphate treatment portion of Alternative 3 would be more difficult to implement. The application of the phosphoric acid treatment on residential properties has not been attempted on a large scale. This treatment alternative uses 85% phosphoric acid, which can cause skin irritation as well as damage to the respiratory system of workers if not handled properly. Phosphoric acid is viscous, making application difficult, and it may crystallize in winter. The phosphoric acid could damage the exterior of a structure such as a home or personal property around the home if the acid is not carefully applied. The property would have to be fenced prior to the application of the phosphoric acid to restrict access to the property during treatment of the property. The fence would have to remain until the lime was applied and the property was revegetated. Small animals and birds would still have access to the property and contact with the soil prior to the application of the lime could pose a health risk to them. Please refer to final paragraph under 1- Overall Protection of Human Health and the Environment.

The health education portion of Alternative 2 and 3 is already implemented. The VICP has been developed and partially implemented with public and stakeholder input. The Conrad Repository will be used for disposal of lead contaminated soil until a public use repository is developed.

Potable water and well construction evaluations under both Alternatives 2 and 3 can be conducted in-house by the EPA without delays or future contracting, so implementation is feasible from an administrative perspective.

7. Cost: Includes estimated capital and operations and maintenance (O&M) costs as well as present worth costs. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 %.

No capital or O&M costs would be associated with Alternative 1 because no remedial actions would be conducted. The present worth cost for Alternative 2 is estimated to be $8.3 million. The present worth cost for Alternative 3 is estimated to be $11.5 million. For both cost estimates, capital costs are spread over a construction period of two years. A 7.0 % discount rate was used to calculate the present worth. These estimates are approximate and made without detailed engineering data. The actual cost of the project would depend on the final scope of the remedial action, actual length of time required to implement the alternatives and other unknown factors.

The historical average amount of soil removed from each property is 186 yd^3 at a construction-only cost of $63 per yd^3. These estimates are averages of past construction activities on this Site, but future costs could vary. For Alternative 3, the phosphoric acid treatment estimated costs could range from $12,305 for as little as one quadrant per property to $49,220 for an entire property.

For Alternatives 2 and 3, costs to address potable water for private wells is projected at a range of $600 dollars for the basic installation of a filter system, to as much as $7,000 for installing a new well, depending on the depth. Under both Alternative 2 and 3, annual costs of $60,000 and $80,000 for the VICP and health education, respectively, would continue for four years and then be incorporated in the annual cost of O&M.

8. State/Support Agency Acceptance: Considers whether the state agrees with the EPA's analyses and recommendations of the RI/FS and the Proposed Plan.

MDNR staff generally support the Preferred Alternative (Alternative 2) proposed by the EPA. Typically, MDNR has approved this same type of work in removal and remedial actions at this and other sites throughout Missouri. However, state acceptance of the Preferred Alternative will be fully determined after the public comment period closes for the Proposed Plan and a formal letter of concurrence is received from MDNR.

9. Community Acceptance: Considers whether the local community agrees with the EPA's analyses and Preferred Alternative. Comments received on the Proposed Plan are important indicators of community acceptance.

Community acceptance of the Preferred Alternative is expected. However, the Preferred Alternative will be reevaluated after the public comment period ends and will be modified, if necessary, and described in the ROD. A Responsiveness Summary (which captures public comments) will be reviewed, evaluated and considered prior to any EPA decision being made on a remedy selection at this Site. This summary will be part of the Final ROD for OU3.

PREFERRED ALTERNATIVE

The Preferred Alternative is Alternative 2 — Excavation, Disposal, Vegetative Cover, Potable Water Corrective Action, Health Education and Institutional Controls. The Preferred Alternative was chosen over the other alternatives by the EPA because, based on the nine NCP criteria, it provides the best balance of available options and achieves the RAO. However, the Preferred Alternative may be altered in response to public comment or new information.

Based upon the information currently available, the EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of available options among the other alternatives with respect to the balancing and modifying criteria. The EPA expects the Preferred Alternative to satisfy the following statutory requirement of Section 121(b) of CERCLA: (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element or explain why the preference for treatment will not be met. The following sections discuss how the Preferred Alternative meets these statutory requirements.

Protection of Human Health and the Environment

The Preferred Alternative will protect human health and the environment at remediated residential properties by achieving the RAOs through conventional engineering measures and ICs. Risks associated with lead-contaminated residential soils at the Site are caused by the potential for direct contact with contaminated soils. The Preferred Alternative eliminates this direct exposure pathway through excavation and replacement of lead-contaminated soils at the residential properties. Contaminated soils will be removed from residential properties, permanently eliminating this identified source of exposure. The implementation of the Preferred Alternative will not pose unacceptable, short-term risks or cross-media impacts.

Health education will continue indefinitely to educate and keep the citizens, contractors and all other stakeholders informed of the dangers of lead and exposure prevention. The community will become aware that living with lead will always be an issue due to the widespread nature of lead contamination.

The VICP will address contaminated soil that remains on site by placing the necessary controls in local hands to prevent recontamination of remediated properties, or new contamination of residential properties. Monitoring will be conducted, and testing will be available for disturbance projects allowing immediate guidance by the MCHD to prevent damage to barriers and the spread of contamination. If disturbance occurs, a disposal location will be available for residents, contractors and local cities and county to dispose of lead contamination.

Potable groundwater at private wells will be assessed within the halo of mine works, mine waste and outfall locations. Filtering, treatment, repair or well replacement, or connection to an alternate water supply will be employed upon determination of the source and cause of contamination to ensure potable groundwater meets the respective MCLs for the COCs detected.

Compliance with ARARs

In general, preferred alternatives should comply with ARARs unless waivers are granted. The Preferred Alternative is expected to meet all chemical-specific, action-specific, and location-specific ARARs and does not involve any waivers. The ARARs for this Proposed Plan are included in Tables 1 through 6.

Cost Effectiveness

The Preferred Alternative is a cost-effective solution to lead-contaminated residential soils at the Site. The Preferred Alternative relies on conventional engineering methods and ICs that are easily implemented. Contaminated soils are removed and replaced, thereby providing a permanent remedy for

remediated residential soils which should not be subject to future costs. Preventing recontamination of properties will also effectively reduce future costs to clean a property to its original remediated condition. Health education and ICs at the local level will reduce future costs through the prevention of recontamination of properties, and also provides easy and effective access by the public to be educated and learn how to safely deal with lead indefinitely in the future.

Utilization of Permanent Solutions and Alternate Treatment Technologies

The Preferred Alternative utilizes a well-demonstrated remediation approach to lead-contaminated soils that will provide a permanent remedy for residential soils. Removal and replacement of contaminated residential soils permanently removes heavy metal contaminants as a potential source of exposure. For a minimal volume of removed, contaminated residential soil, lead stabilization treatment may be needed to prevent the soils from failing TCLP. However, the volume of these soils is not expected to be a significant portion of the total excavated residential soils.

For private wells, the Preferred Alternative also allows for a permanent solution to be incorporated in the remedy considering the cause for contamination may vary, and the permanent solution to correct water quality issues at private wells can vary accordingly.

Health education and the VICP implemented at a local level will provide valuable educational resources and the immediate attention necessary to address proper handling and disposal of contaminated soils necessary to protect the remedy to minimize or eliminate future exposure potential.

Preference for Treatment

The Preferred Alternative does not utilize treatment to address the principle threats posed by the residential property soils. No treatment technologies were identified that have definitively demonstrated the ability to reliably provide short- and long-term effectiveness, permanence, and meet the other NCP criteria. For a very small percentage of contaminated residential soil, lead stabilization treatment may be needed to prevent the soils from failing TCLP. However, the volume of these soils is not expected to be a significant portion of the total excavated residential soils. Additionally, for a small subset of private wells, potable groundwater treatment and/or filtering would be utilized if the cause of contamination is dissolved phase metals or suspended solids, as opposed to well repair or replacement that may be required as a result of a compromised, damaged or deteriorated well condition.

Based upon the information currently available, the EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of available options among the other alternatives with respect to the balancing and modifying criteria. The EPA expects the Preferred Alternative to satisfy the following statutory requirement of Section 121(b) of CERCLA: (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

GLOSSARY OF TERMS

This glossary defines many of the technical terms used in relation to the Madison County Mines Site in this Proposed Plan. The terms and abbreviations contained in this glossary are often defined in the context of hazardous waste management and apply specifically to work performed under the Superfund program. Therefore, these terms may have other meanings when used in a different context.

Administrative Record (AR): All documents which the EPA considers or relies upon in selecting the response action at a Superfund site, culminating in the Record of Decision for remedial action.

Baseline Human Health Risk Assessment (HHRA): A document that provides an evaluation of the potential threat to human health in the absence of any remedial action.

Bioavailability: A risk assessment term; the fraction of an ingested dose that crosses the gastrointestinal epithelium in the stomach and becomes available for distribution to internal target tissues and organs.

Blood Lead Level or Concentration: The concentration of lead in the blood, measured in micrograms of lead per deciliter of blood (µg/dL).

Capital Cost: Direct (construction) and indirect (nonconstruction and overhead) costs including expenditures for equipment, labor, and materials necessary to implement remedial actions.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. The acts created a special tax that went into the Trust Fund, commonly known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites. Under the program, the EPA can either: (1) pay for site cleanup when parties responsible for the contamination cannot be located or are unwilling or unable to perform the work, or (2) take legal action to force parties responsible for site contamination to clean up the site or repay the federal government for the cost of the cleanup.

Contaminant: Any physical, chemical, biological or radiological substance or matter that can have an adverse effect on human health or environmental receptors.

Chemical of Concern (COC): A substance detected at a hazardous waste site that has the potential to affect receptors adversely due to its concentration, distribution and mode of toxicity.

Discount Rate: A percentage rate used in present worth analyses to identify the cost of capital and operation and maintenance expenses. It is used to value a project using the concepts of the time-value of money where future cash flows are estimated and discounted to give them a present value.

Dolomite: A sedimentary rock containing greater than 50% of the mineral dolomite; often found with calcite in forming limestone, another sedimentary rock.

Expanded Site Inspection (ESI): A field investigation that typically follows a preliminary assessment and is designed to collect more extensive information on a hazardous waste site. The information is used to score a site using the Hazardous Ranking System to determine whether a response action is needed.

Exposure Pathways: The course a chemical or physical agent takes from a source to an exposed organism. Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route.

Feasibility Study (FS): A report that analyzes the practicability of potential remedial actions; i.e., a description and analysis of potential cleanup alternatives for a site on the National Priorities List.

Groundwater: Water filling spaces between soil, sand, rock and gravel particles beneath the earth's surface, which often serves as a source of drinking water.

Interim: Temporary or provisional; as used in the Proposed Plan, efforts that address a portion of the Madison County Mines Site on a temporary basis until the final remedy for the entire operable unit is implemented.

National Contingency Plan (NCP): The federal regulation that guides the Superfund program.

National Priorities List: The EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. The list is based primarily on the score a site receives from the Hazard Ranking System.

Operation and Maintenance (O&M): Activities conducted at a site after response actions occur to ensure that the cleanup or containment system continues to be effective.

Present Worth: The amount of money necessary to secure the promise of future payment or series of payments at an assumed interest rate.

Proposed Plan: A plan for a site cleanup that is available to the public for comment which summarizes remedy alternatives and presents the EPA's Preferred Alternative or cleanup approach.

Quadrant Sample: A composite soil sample collected from a portion (usually one quarter) of a residential property.

Record of Decision (ROD): A public document that explains which cleanup alternative(s) will be used at a National Priorities List site.

Remedial Action: The actual construction or implementation phase of a Superfund site cleanup.

Remedial Investigation (RI): An in-depth study designed to gather data needed to determine the nature and extent of contamination at a Superfund site, establish site cleanup criteria, identify preliminary alternatives for remedial action, and support technical and cost analyses of alternatives. The remedial investigation is usually done with the feasibility study. Together they are usually referred to as the RI/FS.

Removal Action: Short-term immediate actions taken to address releases of hazardous substances that require an expedited response.

Responsiveness Summary: A summary of oral and/or written public comments received by the EPA during a comment period on key EPA documents, and the EPA's response to those comments.

Salem Plateau: A dissected karst plain located in south central Missouri and northern Arkansas consisting of rolling uplands and rugged hills with deeply entrenched stream valleys and ranges between about 1,000 feet to 1,400 feet in elevation. There are abundant sinkholes, caves, springs, and losing streams.

Toxicity: The degree to which a chemical substance (or physical agent) elicits a deleterious or adverse effect upon the biological system of an organism exposed to the substance over a designated time period.

Figure 1

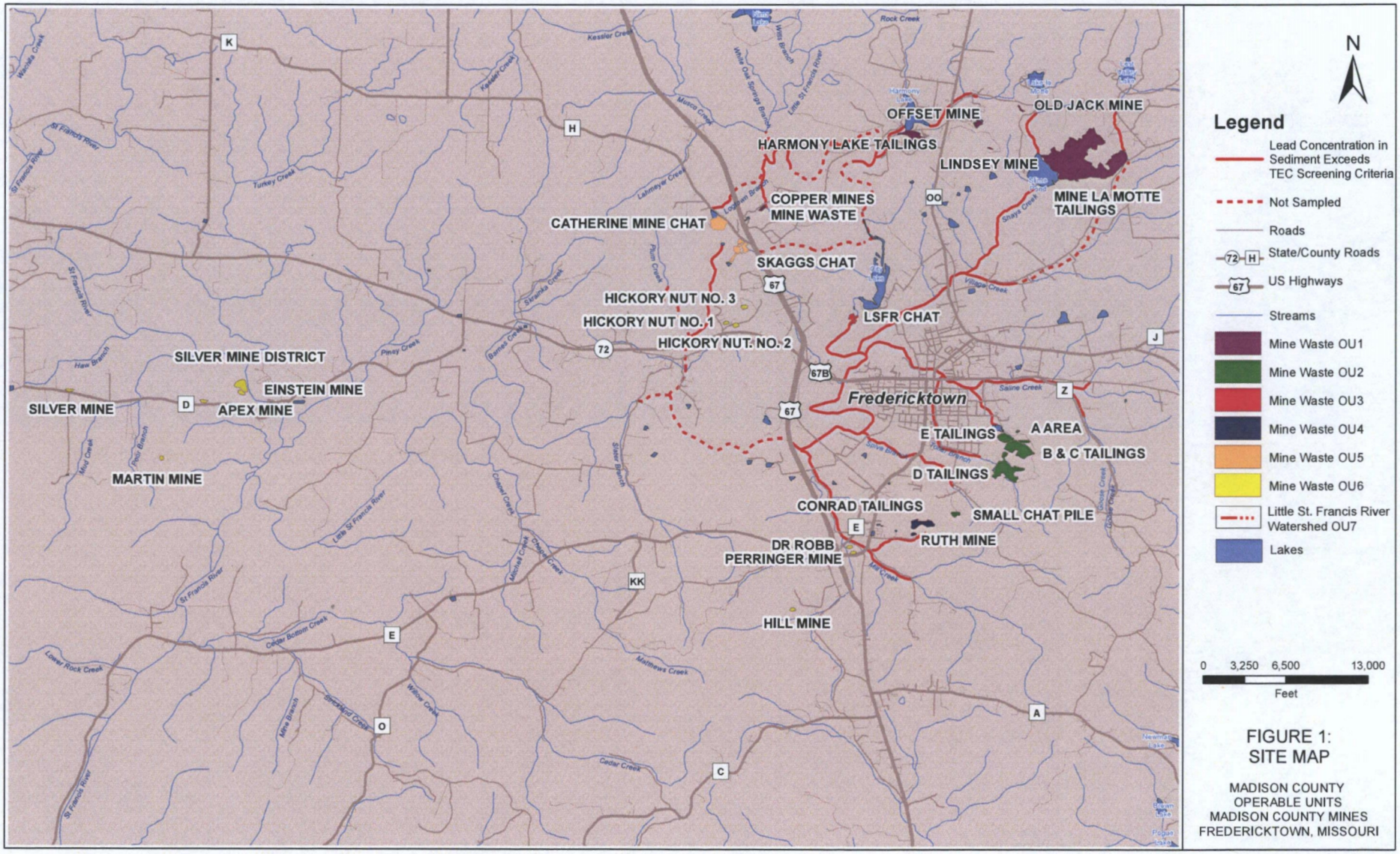
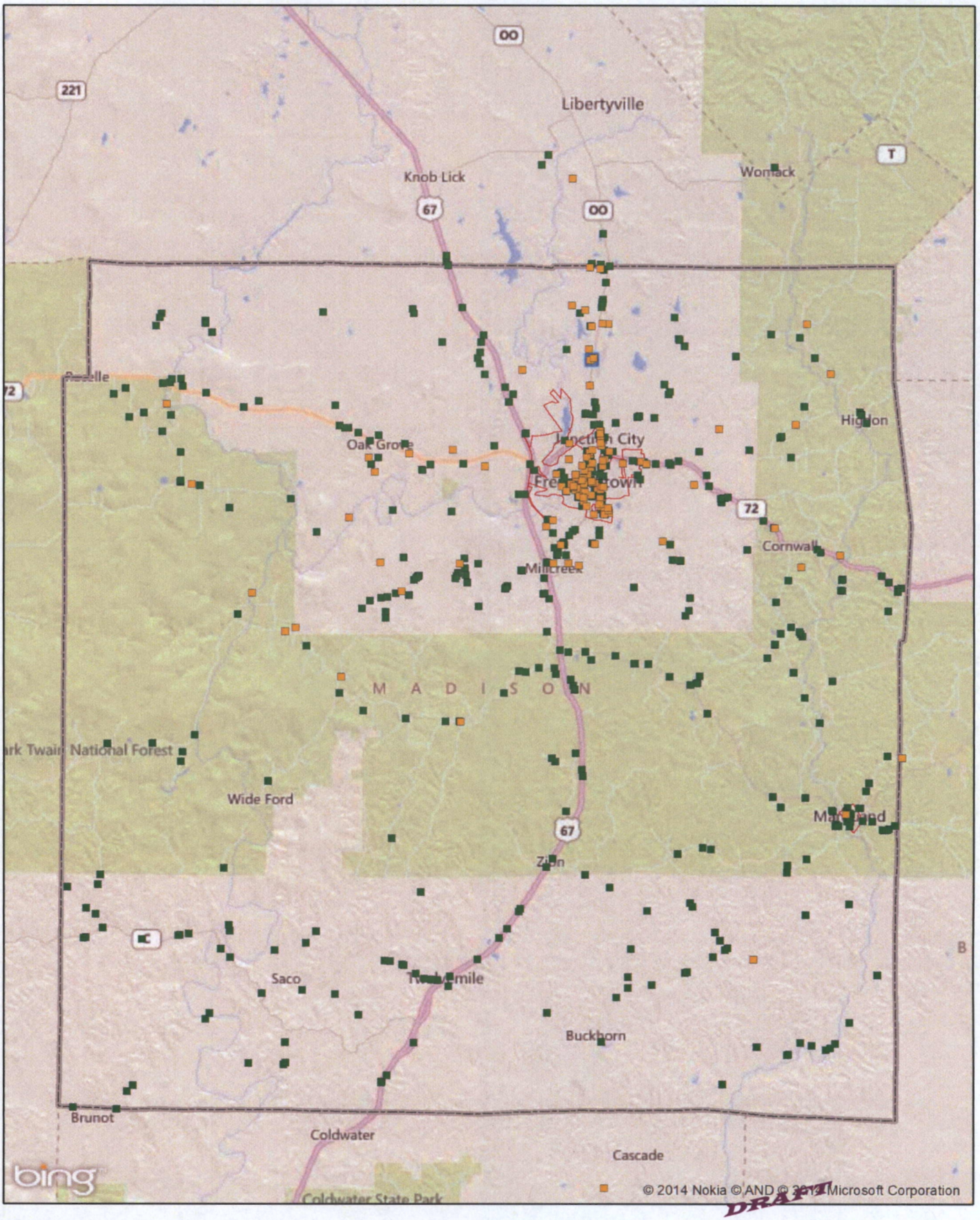


FIGURE 1:
SITE MAP

MADISON COUNTY
OPERABLE UNITS
MADISON COUNTY MINES
FREDERICKTOWN, MISSOURI

Figure 2



NOTE: The Environmental Protection Agency does not guarantee the accuracy, completeness, or timeliness of the information shown, and shall not be liable for any injury or loss resulting from reliance upon the information shown.
CJM 7/16/2014
2014 Madison Co Unsampled

Data Sources:
Imagery provided by Bing Maps
Property Status: EPA 2014

0 2.5 5
Miles

Property Status
- Eligible for Remediation
- Waiting to be Sampled

Madison County Mines Superfund Site
OU3-Residential Cleanup

Table 1
Federal Chemical-Specific ARARs

	Citations	Description
A. ARARs		
1. Safe Drinking Water Act	National Primary Drinking Water Standards 40 C.F.R. Part 141 Subpart B and G	Establish maximum contaminant levels (MCLs), which are health based standards for public waters systems.
2. Safe Drinking Water Act	National Secondary Drinking Water Standards 40 C.F.R. Part 143	Establish secondary maximum contaminant levels (SMCLs) which are non-enforceable guidelines for public water systems to protect the aesthetic quality of the water. SMCLs may be relevant and appropriate if groundwater is used as a source of drinking water.
3. Safe Drinking Water Act	Maximum Contaminant Level Goals (MCLGs) 40 C.F.R. Part 141, Subpart F	Establishes non-enforceable drinking water quality goals. The goals are set to levels that produce no known or anticipated adverse health effects. The MCLGs include an adequate margin of safety.
4. Clean Water Act	Water Quality Criteria 40 C.F.R. Part 131 Water Quality Standards	Establishes non-enforceable standards to protect aquatic life. May be relevant and appropriate to surface water discharges, or may be a TBC.
5. Clean Air Act	National Primary and Secondary Ambient Air Quality Standards 40 C.F.R. Part 50	Establishes standards for ambient air quality to protect public health and welfare.
7. Residential Lead-Based Paint Hazard Reduction Act	Toxic Substances Control Act (TSCA) Disclosure Rule 1018, August 2009. 40 C.F.R. Part 745.220 Subpart I.	Requires persons conducting lead-based paint activities, which includes cleanup of lead-contaminated soil, to follow certification requirements and work practice standards
B. To Be Considered		
1. EPA Revised Interim Soil-lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities and 1998 Clarification	Office of Solid Waste and Emergency Response (OSWER) Directive 9355.4-12, July 14, 1994, OSWER Directive 9200.4-27P, August 1988	Establishes screening levels for lead in soil for residential land use, describes development of site-specific preliminary remediation goals, and describes a plan for soil-lead cleanup at CERCLA sites. This guidance recommends using the EPA Integrated Exposure Uptake Biokinetic Model (IEUBK) on a site-specific basis to assist in developing cleanup goals.
2. EPA Strategy for Reducing Lead Exposures	EPA, February 21, 1991	Presents a strategy to reduce lead exposure, particularly to young children. The strategy was developed to reduce lead exposure to the greatest extent possible. Goals of the strategy are to 1) significantly reduce the incidence above 10 µg Pb/dL in children; and 2) reduce the amount of lead introduced into the environment.
3. Human Health Risk Assessment Report (HHRA)	"Area-Wide Human Health Risk Assessment for the Madison County Mines Site, Madison County, Missouri" – prepared by Syracuse Research Corp., July 2007	Evaluates baseline health risk due to current site exposures and established contaminant levels in environmental media at the site for the protection of public health. The risk assessment approach using this data should be used in determining cleanup levels because ARARs are not available for contaminants in soils.
4. Superfund Lead-Contaminated Residential Sites Handbook	EPA OSWER 9285.7-50, August 2003.	Handbook developed by EPA to promote a nationally consistent decision making process for assessing and managing risks associated with lead contaminated residential sites across the country.
5. Preliminary Remediation Goals	Preliminary Remediation Goals for Lead in Soil at the Madison County Mines, Operable Unit 3 Site, Madison County, Missouri, January 31, 2008.	Establishes preliminary remediation goals for protection of residents from lead in surface soil at the Madison County Mines Site, Operable Unit 3.

Table 2
State Chemical-Specific ARARs

	Citation	Description
A. ARARs		
1. Missouri Air Conservation Law	Missouri Department of Natural Resources RSMo 643.010 10 CSR 10-6.010	Sets ambient air quality standards for a variety of constituents, including particulate matter and lead. Provides long range goals for ambient air quality throughout Missouri in order to protect the public health and welfare.
2. Hazardous Waste Management Law	Missouri Department of Natural Resources Identification and Listing of Hazardous Waste 10 CSR 25-4.261 (A) 1, 2, 4	Defines those solid wastes which are subject to regulations as hazardous wasters under 10 CSR 25.
3. Missouri Clean Water Law	Missouri Department of Natural Resources RSMo 644.006 10 CSR 20-7.015 (1) (2) (3) (4) (5) (6) (7) (9)	Sets forth the limits for various pollutants which are discharged to the various waters of the state. Sets effluent standards that will protect receiving streams.
4. Missouri Clean Water Law	Missouri Department of Natural Resources RSMo 644.006 10 CSR 20 – 7.031 (2) (3) (4) (5); Tables (A) (B)	Identifies beneficial uses of waters of the State, criteria to protect their uses, and defines the anti-degradation policy.
B. To Be Considered	None	

Table 3
Federal Location-Specific ARARs

	Citation	Description
A. ARARs		
1. Historic project owned or controlled by a federal agency	National Historic Preservation Act: 16 U.S.C. 470, et.seq; 40 C.F.R. § 6.301; 36 C.F.R. Part 1.	Property within areas of the Site is included in or eligible for the National Register of Historic Places. The remedial alternatives will be designed to minimize the effect on historic landmarks.
2. Site within an area where action may cause irreparable harm, loss, or destruction of artifacts.	Archeological and Historic Preservation Act; 16 U.S.C. 469, 40 C.F.R. 6.301.	Property within areas of the site may contain historical and archaeological data. The remedial alternative will be designed to minimize the effect on historical and archeological data.
3. Site located in area of critical habitat upon which endangered or threatened species depend.	Endangered Species Act of 1973, 16 U.S.C. 1531-1543; 50 C.F.R. Parts 17; 40 C.F.R. 6.302. Federal Migratory Bird Act; 16 U.S.C. 703-712.	Determination of the presence of endangered or threatened species. The remedial alternatives will be designed to conserve endangered or threatened species and their habitat, including consultation with the Department of Interior if such areas are affected.
4. Site located within a floodplain soil.	Protection of Floodplains, Executive Order 11988; 40 C.F.R. Part 6.302, Appendix A.	Remedial action may take place within a 100-year floodplain. The remedial action will be designed to avoid adversely impacting the floodplain in and around the soil repository to ensure that the action planning and budget reflects consideration of the flood hazards and floodplain management.
5. Wetlands located in and around the soil repository.	Protection of Wetlands; Executive Order 11990; 40 C.F.R. Part 6, Appendix A.	Remedial actions may affect wetlands. The remedial action will be designed to avoid adversely impacting wetlands wherever possible including minimizing wetlands destruction and preserving wetland values.
6. Waters in and around the soil repository.	Clean Water Act, (Section 404 Permits) Dredge or Fill Substantive Requirements, 33 U.S.C. Parts 1251-1376; 40 C.F.R. Parts 230, 231.	Capping, dike stabilization, construction of berms and levees, and disposal of contaminated soil, waste material or dredged material are examples of activities that may involve a discharge of dredge or fill material. Four conditions must be satisfied before dredge and fill is an allowable alternative: 1. There must not be a practical alternative. 2. Discharge of dredged or fill material must not cause a violation of State water quality standards, violate applicable toxic effluent standards, jeopardize threatened or endangered species or injure a marine sanctuary. 3. No discharge shall be permitted that will cause or contribute to significant degradation of the water. 4. Appropriate steps to minimize adverse effects must be taken. Determine long- and short-term effects on physical, chemical, and biological components of the aquatic ecosystem.

Table 3 (Continued)
Federal Location-Specific ARARs

A. ARARs (Continued)	Citation	Description
7. Area containing fish and wildlife habitat in and around the removal repository.	Fish and Wildlife Conservation Act of 1980, 16 U.S.C. Part 2901 et seq.; 50 C.F.R. Part 83.9 and 16 U.S.C. Part 661, et seq. Federal Migratory Bird Act, 16 U.S.C. Part 703.	Activity affecting wildlife and non-game fish. Remedial action will conserve and promote conservation of non-game fish and wildlife and their habitats.
8. Fish and Wildlife Coordination Act	16 U.S.C Section 661 et seq.; 33 C.F.R Parts 320-330; 40 C.F.R 6.302	Requires consultation when a Federal department or agency proposes or authorizes any modification of any stream or other water body, and adequate provision for protection of fish and wildlife resources.
9. 100-year floodplain	Location Standard for Hazardous Waste Facilities- RCRA; 42 U.S.C. 6901; 40 C.F.R. 264.18(b).	RCRA hazardous waste treatment and disposal. Facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout during any 100-year/24 hour flood.
10. Historic Site, Buildings, and Antiquities Act	16 USC Section 470 et seq., 40 CFR Sect. 6.301(a), and 36 CRF, Part1.	Requires Federal agencies to consider the existence and location of landmarks on the National Registry of Natural Landmarks and to avoid undesirable impacts on such landmarks.
11. Clean Air Act	National Ambient Air Quality Standards/ NESHAPS 42 U.S.C. 74112; 40 C.F.R. 50.6 and 50.12	Emissions standards for particular matter and lead.
B. To Be Considered	None	

Table 4
State Location-Specific ARARs

	Citation	Description
A. ARARs		
1. Missouri Wildlife Code	Missouri Department of Natural Resources 3 CSR Sec. 10 – 4.111	Requires a determination of the presence or absence of endangered or threatened species, and provides for regulation of non-game wildlife. Places restrictions on actions affecting protected species. Remedial action will conserve and promote conservation of non-game fish and wildlife and their habitats.
B. To Be Considered	None	

Table 5
Federal Action-Specific ARARs

	Citation	Description
A. ARARs		
1. Disposal of Solid Waste in the Permanent Repository and closure of the Removal Repository.	Subtitle D of RCRA, Section 1008, Section 4001, et seq., 42 U.S.C. '6941, et seq.	State or Regional Solid Waste Plans and implementing federal and state regulations to control disposal of solid waste. The yard soils disposed in the repository may not exhibit the toxicity characteristic and therefore, are not hazardous waste. However, these soils may be solid waste. Soils failing TCLP were contaminated by mining wastes so all wastes are exempt from definition of hazardous waste per the Bevill exemption. Contaminated residential soils will be consolidated from yards throughout the site into a few repositories. The disposal of this waste material should be in accordance with regulated solid waste management practices.
2. Clean Water Act	Water Quality Criteria 40 C.F.R. Part 131 Water Quality Standards	Establishes non-enforceable standards to protect aquatic life.
3. Clean Air Act	National Ambient Air Quality Standards/ NESHAPS 42 U.S.C. 74112; 40 C.F.R. 50.6 and 50.12	Emissions standards for particular matter and lead.
4. Hazardous Materials Transportation Act	Hazardous Materials Transportation Regulations 49 C.F.R. Parts 107, 171-177	Regulates transportation of hazardous materials.
5. NPDES Storm Water Discharge for Permanent Repository.	40 C.F.R. Part 122.26; 33 U.S.C 402 (p)	Establishes discharge regulations for storm water. Required management of repository where waste materials come into contact with storm water. Also required during construction of the repository.
6. Transportation of excavated soils.	DOT Hazardous Material Transportation Regulations, 49 C.F.R. Parts 107, 171-177	Regulates transportation of hazardous wastes.
7. Waters in and around the soil repository.	Clean Water Act, (Section 404 Permits) Dredge or Fill Substantive Requirements, 33 U.S.C. Parts 1251-1376; 40 C.F.R. Parts 230,231.	Capping, dike stabilization, construction of berms and levees, and disposal of contaminated soil, waste material or dredged material are examples of activities that may involve a discharge of dredge or fill material. Four conditions must be satisfied before dredge and fill is an allowable alternative: 1. There must not be a practical alternative. 2. Discharge of dredged or fill material must not cause a violation of State water quality standards, violate applicable toxic effluent standards, jeopardize threatened or endangered species or injure a marine sanctuary. 3. No discharge shall be permitted that will cause or contribute to significant degradation of the water. 4. Appropriate steps to minimize adverse effects must be taken. Determine long- and short-term effects on physical, chemical, and biological components of the aquatic ecosystem.
B. To Be Considered	None	

Table 6
State Location-Specific ARARs

	Citation	Description
A. ARARs		
2. Missouri Wildlife Code	Missouri Department of Natural Resources 3 CSR Sec. 10 – 4.111	Requires a determination of the presence or absence of endangered or threatened species, and provides for regulation of non-game wildlife. Places restrictions on actions affecting protected species. Remedial action will conserve and promote conservation of non-game fish and wildlife and their habitats.
B. To Be Considered	None	

SUBJECT:	PART: Introduction
Introduction	SECTION: 0.1
REFERENCES	EFFECTIVE:
	Revisions: October 2013

Madison County Voluntary Institutional Controls Manual

Developed by The Grindstaff Partnership, LLC
in partnership with
the Citizens of
Madison County Missouri

SUBJECT:	PART: Introduction
Credits	SECTION: 0.2
REFERENCES	EFFECTIVE:
	Revisions: October 2013

CREDITS

The Madison County Voluntary Institutional Controls Plan is unique from all other institutional controls plans which focus on lead contamination. Its unique quality is its voluntary nature. Like other lead contamination control plans, Madison County's plan outlines specific controls based on United States Environmental Protection Agency (EPA), Missouri Department of Natural Resourses (DNR) and Missouri Department of Health and Senior Services (DHSS) regulations/policies, and these controls are further expressed in individual "best practices" regarding excavation, hauling and disposal activities. However, unlike other lead contamination plans, the Madison County plan provides education as one of its primary institutional controls.

This manual was created with the assistance of the following entities:

The Madison County Commission in the State of Missouri
The Madison County Health Department
The Madison County Voluntary Institutional Control Plan Coalition consisting of residents of Madison County Missouri
The Missouri Department of Health and Senior Services
The Missouri Department of Natural Resources
The United States Environmental Protection Agency
The Grindstaff Partnership, LLC

The development and implementation of the Voluntary Institutional Controls Plan and manual was supported under a cooperative agreement between the U.S. Environmental Protection Agency (EPA) and the Missouri Department of Health and Senior Services (DHSS). Funding was provided to the Madison County Health Department through this cooperative agreement as a pilot project for the Madison County Mines Superfund Site. Its contents are solely the responsibility of

the authors and do not necessarily represent the official views of EPA or the DHSS.

SUBJECT:	PART: Introduction
Table of Contents	SECTION: 0.3
REFERENCES	EFFECTIVE:
	Revisions: January 2014

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SUBJECT:	PART: Introduction
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REFERENCES	EFFECTIVE:
	Revisions: January 2014

SUBJECT: Living With Lead	PART: Administrative Framework
	SECTION: 1.1
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: October 2013

LIVING WITH LEAD

As residents of Madison County, Missouri, we understand that lead is a part of our lives. We know that because of the unique geological qualities of our land, lead can be found both on the surface and under the ground. We also know that 300 years of mining and processing in and among our communities has impacted our land, our water, and our lives.

Living in Madison County requires living with lead. We have built our communities from the wealth of lead. We have grown generations of our families from the abundance of lead. We have created a part of our culture and history from the existence of lead. To live in Madison County is to live with lead. We see the lead and we see the impact of lead on our lives, both the benefits and the challenges.

However, we see what surrounds the lead as well. In Madison County, we live within the St. Francois Mountains and the streams and rivers flowing out of the mountains. We live with farming of livestock, grain, and produce in our fertile fields and valleys. We live in rural communities that value the individual, the family, the community, our beliefs, our education, and our children. We understand the necessity for cooperation and collaboration as a part of our rural foundation of survival.

We also value as a rural foundation, a hearty sense of independence. Historical records illustrate that from the very beginning of our land's inclusion in this country, our ancestors asserted their independent attitudes regarding issues such as property development and ownership of mineral rights. Just as we recognize the importance of independence in the formation of our nation, we recognize the important role it plays in the day to day life of our county's residents. After all, we realize that what works for our county may not work for others, and what works for other counties, may not work for ours.

SUBJECT: Living With Lead	PART: Administrative Framework
	SECTION: 1.1
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: October 2013

Living in Madison County has afforded us both the benefits and challenges associated with lead. As with generations past, we want to live and work around lead in safe, healthy, efficient, and profitable ways. While we continue to listen to our elder's stories, educate ourselves with legitimately researched information, and gain wisdom from our generations of experience, we find new ways to live around lead. Just as our families who worked the mines of the 20th Century did not use the exact same knowledge, techniques and tools from the one-hundred years before, we, in turn, will not live and work with lead and its by-products using the exact same knowledge, techniques, and tools we had in the 20th Century.

SUBJECT: Our Challenge and Response	PART: Administrative Framework
	SECTION: 1.2
REFERENCES	EFFECTIVE:
	Revisions: October 2013

OUR CHALLENGE & RESPONSE

Madison County's geography, geology, history, and culture is unique in some ways to any other county in the nation; thus, we have created a unique way to respond to some of our current concerns and questions regarding our life with lead. Because of the amount of lead on and in our land, our county has been listed on the United States Environmental Protection Agency's (EPAs) National Priorities List of contaminated sites. We have worked with the State of Missouri and the Federal Government to educate ourselves and others about health, safety, and environmental concerns. We have allowed the Department of Natural Resources (DNR) and the EPA on our land to perform soil and water tests and to clean up residential areas containing higher percentages of lead than are considered protective of human health.

Now, as we look toward our historical and economical future independent from the lead companies of the past, we want to live on and work with our land in ways that keep additional lead contamination to a minimum. To this end, we have formed a Madison County Voluntary Institutional Controls Plan (VICP). All communities named on the National Priorities List will create some kind of plan for contamination management, but our VICP is unique as it is the only plan in the nation that allows for partnership and engagement in a voluntary way.

Our VICP allows us to educate ourselves with the latest science and health information and work with one another as the need arises instead of telling one another what we have to do because a law says so. As science evolves and as our needs evolve, we can figure out for ourselves the land management practices that work best over a number of years and modify our methods of management through the VICP. Lastly, our VICP will work through partnership within our community, encouraging the kind of cooperation and collaboration our rural tradition values without discouraging the independent attitude our residents have thrived on from the beginning of our county's history.

SUBJECT:	PART: Administrative Framework
Overview of Madison County Lead History and VICP	SECTION: 1.3
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: January 2014

OVERVIEW OF MADISON COUNTY LEAD HISTORY & VICP

Lead History Leading to Superfund Site

Much of the land known as Madison County was part of southeastern Missouri called "The Old Lead Belt". One of the oldest lead mines west of the Mississippi, Mine LaMotte, sat on the northern end of the county. During the 20th Century, "The Lead Belt" was the site of the largest lead mining operations in the world. The processing and smelting of lead in Madison County left 13 identified major areas of mine waste (chat and slime). The mine waste contains elevated levels of lead and other heavy metals which we now know pose a threat to human health and the environment. The mine waste contaminated soil, sediment, surface water, and groundwater, both on the waste property and elsewhere, as it was transported by both natural and human modes.

Remediation Efforts and Management of Remediation

The superfund law (CERCLA) was enacted in 1980. This law gave the U.S. Environmental Protection Agency (EPA) the authority to find contaminated areas around the United States and clean them up, using funds from whatever parties were designated as the potentially responsible parties (PRP's).

In 1995, EPA performed an Expanded Site Inspection on the Little St. Francis River watershed. The results of this inspection indicated elevated concentrations of a number of heavy metals in samples of mine waste, groundwater, sediment, and soil. Studies were also being conducted by the Missouri Department of Health and Senior Services and the Madison County Health Department. These studies concluded that some children in Madison County had elevated levels of lead in their blood.

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Overview of Madison County Lead History and VICP	SECTION: 1.3
REFERENCES	EFFECTIVE: October 1, 2012
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Because of the previous investigations, the presence of mine waste piles, the elevated blood lead levels in children, and a request for a site-specific assessment from the Madison County Health Department, EPA began conducting a number of assessments to see if contaminated soil removal was needed. These assessments led to specific removal actions in Harmony Lake, Fredericktown, sensitive population areas (daycare centers, public parks, other public recreational facilities), and homes with potentially lead-impacted children. As a part of the assessments, EPA collected and analyzed samples of water and soil with the results indicating high concentrations of a variety of heavy metals. Surface water samples showed iron, lead, nickel, aluminum, copper, and silver concentrations which exceeded the Missouri Department of Natural Resources aquatic life standards.

In 2003, because of the elevated levels of heavy metals present, Madison County was put on the National Priorities List (NPL). This is how Madison County received the designation, "Superfund". Since the "Superfund" designation, even more properties have been assessed, and more removal actions have occurred.

Management of Remediation (Voluntary Institutional Controls Plan)

Once a Superfund site has been remediated, a management plan (usually called institutional controls) needs to be put in place so that the land does not get re-contaminated. Management plans have similar components as they are created based on the federal, state, and local laws in existence, but each site's management plan reflects the unique needs and requirements of its individual location. Madison County's management plan, or set of institutional controls, focus on digging, hauling and disposal of soil.

Specific methods of digging, depending on the condition of the soil relative to lead content, have been developed for residents and professionals to use when digging in Madison County soil. These methods are referred to as "Best Practices". Similarly, hauling and disposal best practices have also been developed for Madison County based on state and federal hauling and disposal regulations.

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What does "voluntary" mean to you?

Some institutional controls plans involve the creation of local ordinances and development of permits to insure that residents and businesses use the best practices. Madison County has chosen not to create local ordinances or develop permits. Instead, the Madison County Health Department will be the point of contact for guidance regarding the voluntary management plan. The word, "voluntary" simply means there are no local ordinances overseeing the digging, hauling, and disposal of soil. However, there are state and federal oversight regulations that may apply.

Madison County has created a management and education plan through the health department. Although they have no means of regulatory oversight, the health department will have the capacity to assist property owners and professionals both in understanding soil conditions and understanding how to use the best practices. Through the EPA Sampled and/or Remediated Properties Database for Madison County, the health department will also have the capacity to assist property owners and businesses record digging actions as they are performed on property within the county.

The State of Missouri does have regulatory oversight over hauling and disposal practices. If hauling and disposal best practices are not used properly, businesses may be held accountable for those actions by the Missouri Department of Natural Resources.

The Environmental Protection Agency also has regulatory oversight over the entire Superfund site. Every five years, EPA will review the progress of the Voluntary Institutional Controls Plan during its Five-Year Review Process. This review process will include random sample collection at properties remediated. If remediated properties have become re-contaminated, property owners and

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REFERENCES	EFFECTIVE: October 1, 2012
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businesses that performed digging, hauling, and disposal actions on that property may be held accountable.

SUBJECT:	PART: Administrative Framework
Health Effects of Lead	SECTION: 1.4
REFERENCES EPA Lead in Your Home Guide EPA Lead Poisoning and Your Children Pamphlet Missouri Department Health and Senior Services Testing Your Drinking Water for Lead Pamphlet Center for Disease Control and Prevention	EFFECTIVE: Revisions: January 2014

HEALTH EFFECTS OF LEAD

Lead is poisonous and can create ill health effects that can potentially affect almost every organ and system in the body. Lead poses significant challenges as it cannot be seen or smelled. Lead can enter the body though the lungs when you inhale or the mouth when you swallow. The human body stores lead in the same manner as it does calcium, a mineral that strengthens bones. Once ingested, lead, like calcium, will stay in the bloodstream for a few weeks. Some of the lead is naturally excreted while the remaining lead is deposited in the body's soft tissues (liver, kidneys, lungs, brain, spleen, muscles, and heart) or absorbed in the bones. Lead can remain stored in bones for a lifetime.

Lead can have negative health effects on everyone, however, children ages six and younger are highly susceptible to the effects of lead because the bodies of children in this age group develop rapidly and absorb more lead. Young children are also more apt to place lead contaminated objects in their mouths. Pregnant women exposed to lead can pass the lead contaminants from their bodies to their unborn babies.

Children with pica behavior are at high risk for increased blood lead levels and at high risk to experience negative health effects from lead. Pica behavior is the craving to eat nonfood items, such as dirt, paint chips, and clay. Pica behavior is most common in one and two year old children and usually diminishes with age. Pica behavior has also been observed in adults, particularly pregnant women.

Some of the known health effects from of lead exposure in children are:

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- Nervous System Damage
- Kidney Damage
- Learning Disabilities (Attention Deficit Disorder and Decreased Intelligence)
- Speech, Language, and Behavior Problems
- Poor Muscle Coordination
- Decreased Muscle and Bone Growth
- Headaches
- Hearing Damage
- Seizures
- Brain Damage

Some known health effects from high levels of lead exposure in adults are:

- Fertility Problems (men and women)
- Difficulties During Pregnancy
- High Blood Pressure
- Digestive Problems
- Nerve Disorders
- Memory and Concentration Problems
- Muscle and Joint Pain
- Seizures
- Brain Damage

Lead in soil poses health risks to both adults and children in the same manner as any other lead source. Lead in soil is easily susceptible to migration and can

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become airborne by excavations activities or weather elements such as wind. Soil lead can also be spread to water sources or remediated areas by rain or run-off from storm water. Furthermore, soil lead can migrate through the tracking on tires of vehicles or from being hauled in an unenclosed vehicle. The Madison County VICP strives to reduce the lead health risks to both children and adults by providing best practices to effectively manage lead contamination and best practices for prevention of migration of lead contamination.

For further information on the health effects of lead, you can view the Center for Disease Control and Prevention (CDC) website at: http://www.cdc.gov/.

SUBJECT:	PART: Administrative Framework
Purpose	SECTION: 1.5
REFERENCES	EFFECTIVE:
	Revisions: January 2014

PURPOSE

THE PRIMARY PURPOSE OF OUR PLAN

A record of decision (ROD) for residential properties by Environmental Protection Agency (EPA) was developed through public meetings and a public comment period. Institutional controls or the Voluntary Institutional Controls Plan (VICP) was determined necessary to protect the remedy at the site. The primary purpose of the VICP is to give residents and workers in Madison County, Missouri the tools to effectively manage lead contamination both on their property and on the land of the county as a whole. Our plan strongly encourages all residents and workers who engage in activities involving excavations, building development, construction, renovation and grading within Madison County to use the management resources and guidelines provided. Specifically, our VICP resources and guidelines encourage the installation and maintenance of contamination barriers and the implementation of other contaminant management standards shown to minimize the migration of, and particularly, human exposure to contaminants within the soil, as necessary to protect the public health and the environment. The Madison County VICP strives to reduce the lead health risks to both children and adults by providing best practices to effectively manage lead contamination and best practices for prevention of migration of lead contamination.

SUBJECT:	PART: Administrative Framework
Management of Our Plan	SECTION: 1.6
REFERENCES	EFFECTIVE:
	Revisions: January 2014

MANAGEMENT OF OUR PLAN

Typical institutional controls plans are not voluntary; rather, they are supervised under the federal authority of the Environmental Protection Agency (EPA), the individual state authority, and the local authority of the county. Our institutional controls plan is different. In the case of our Voluntary Institutional Controls Plan (VICP), Madison County, in partnership with both the State of Missouri and EPA, has enacted a process for creating a cultural attitude shift regarding lead health and safety and for strongly encouraging and supporting both individual resident and community management of lead contamination, without the attempt to enact more laws.

The success of our VICP will not only be measured by property management and certification records on file with the county, it will also be expressed by the broadening of understanding residents have regarding lead health and safety and contamination management on their property. Local management of our VICP provided by Madison County is necessary for success as this type of management provides efficient, economical, and accessible administration by actual residents of the county. Therefore, because of their roles in county leadership and lead health and contamination management up to the present, the Madison County Commissioners, City of Fredericktown authorities, and the Madison County Health Department (MCHD) shall be the local management partners.

The MCHD shall manage the education and resources stated in the plan. As these resources are developed, other local VICP partners who would provide appropriate and efficient management of a specific resource may take on a management role in place of or in partnership with the MCHD. The Madison County Commissioners, City of Fredericktown, and the MCHD in cooperation with other VICP partners, as they develop, have the responsibility of changing the VICP to fit the needs of Madison County residents as science and management practices evolve.

SUBJECT:	PART: Administrative Framework
Management of Our Plan	SECTION: 1.6
REFERENCES	EFFECTIVE:
	Revisions: January 2014

Management Responsibilities

As the present partner responsible for management of the Voluntary Institutional Control Plan (VICP), the Madison County Health Department (MCHD) will work together with county residents, businesses, schools, and other public and private parties; the local governments; the State of Missouri; and the United States Environmental Protection Agency (EPA) to manage contaminants within Madison County, Missouri. Specific management responsibilities include:

1. Developing, with the assistance of residents, local professionals, city and public utilities representatives, County and State officials, and EPA; educational materials regarding contamination management (including instructions regarding the implementation of barriers and other contaminant management best practices), lead health information, historical impact of lead to the County, and best practices for public health and contamination management;

2. Training contractors, utility personnel, and government entities which may disrupt or install barriers or otherwise disturb contaminants about excavation best practices;

3. Adopting contamination management best practices;

4. Adopting barrier construction and maintenance best practices;

5. Educating county residents and professionals about existing transportation and disposal regulations;

6. Providing educational materials for promotion and dissemination to citizens about the VICP and best practices including businesses, bankers, realtors,

and other land transaction professionals who may be involved in land transfers and land development as VICP partners;

7. Adopting an evaluation procedure for VICP modifications based on the latest science, legal statutes, and management practices.

Additional Provisions

In order to assist those engaging in the Voluntary Institutional Control Plan (VICP), it is the intent of the Madison County Health Department (MCHD) to provide either as a sole agency or in cooperation with other local agencies, as needed:

1. Technical assistance, including Dig Rite program and soil screening;
2. Lead poisoning prevention and intervention activities;
3. A readily available repository for contaminated soil;
4. Clean fill to restore barriers for small projects;
5. Disposal containers to assist in removing contaminated soil from small projects and to assist in the transportation and disposal of such soil;
6. Educational materials for promotion and dissemination to county residents, businesses, and other public and private parties;
7. Education and training in the appropriate implementation of the VICP for professional VICP partners;

8. A database tracking system to assist the public, lenders, and potential purchasers of property within the county;

9. Guidelines for managing contaminants.

SUBJECT: Funding	PART: Administrative Framework
	SECTION: 1.7
REFERENCES	EFFECTIVE:
	Revisions: October 2013

FUNDING OF OUR PLAN

Funding from outside the county, as Madison County does not have the funds to fully support the Voluntary Institutional Control Plan (VICP), is also necessary for our plan to succeed. Funding as contracted between the State of Missouri and the United States Environmental Protection Agency (EPA) will be shared between the two—the EPA funding the Madison County Superfund Site until remediation efforts are complete and the State of Missouri funding the site afterward. As the State of Missouri may not have the budget required to fund the VICP in perpetuity, other outside funding sources are being explored.

SUBJECT:	PART: Administrative Framework
VICP Implementation and Maintenance	SECTION: 1.8
REFERENCES	EFFECTIVE:
	Revisions: January 2014

VICP IMPLEMENTATION & MAINTENANCE

It is the intent of the Madison County Health Department (MCHD) to procure funding for and then provide the following resources to support lead contaminant management in Madison County. As funding for the items is procured, each resource will be developed with the standards listed below:

1. **Establishment and Management of a Permanent Records Library**—A permanent library for property records, educational materials, and public relations information will be established. This site will house all property records for Madison County. In addition to the basic property information, the records will contain information pertaining to testing and soil cleanup activities in Madison County such as:
    a. Areas of property that were remediated;
    b. Areas of property that were tested but have not been remediated;
    c. Depth of satisfactory soil;
    d. Barriers used to separate satisfactory soil from contaminated soil;
    e. Levels of lead in satisfactory, remediated, and unclean areas;
    f. New areas of property development and management records.

    All records will be computerized for easy access. Educational material and public relations material relating to the Superfund cleanup activities will also be housed at the site.

2. **Establishment and Management of Contaminant Management Addition to "Dig Rite" Program**—The permanent records library will also manage a digging/identification program that connects with the Dig-Rite underground identification program. Specific services of this program will include:
    a. Connection with Dig-Rite /Missouri One Call (underground identification) program;

b. MCHD personnel available to mark areas of property including: barriers, remediated versus unclean areas and potential sampling areas;
c. XRF screening of property at resident request (Specific services this program **WILL NOT** provide include soil sampling and laboratory analysis. Soil sampling and analysis will be conducted by EPA representative or private company and a certified laboratory. It should be noted that XRF soil screening is a preliminary process to determine if lead contamination is present and if additional testing or analysis is needed. Soil sampling and analysis is a detailed testing of soil to determine the extent of lead contamination and depths of the contamination);
d. Education about soil disturbance guidelines and hauling regulations.

3. **Establishment and Management of Permanent Soil Repository Sites--** Permanent repositories for contaminated soil will be established as needed. The site(s) will be the repository for contaminated soil in Madison County. The MCHD will be the contact for those needing location, directions, and best practices information regarding the repository site currently being used. Contaminated soil removed from construction projects; property owner's land usage; and city, county, state, and/or federal projects will be transported using federal and state guidelines to the appropriate repository site. The site(s) will have controls and procedures to encourage appropriate use of site and transportation of soil that may include: Educational guidelines pertaining to the appropriate uses for the site and transportation regulations housed at the Madison County Health Department (MCHD) and distributed to individuals and entities deemed beneficial in encouraging appropriate use of repository and transportation of contaminated soil, controlled site access by some combination of fencing and/or signs warning against soil removal for fill and dumping without the use of appropriate controls around the perimeter, and an area for appropriate decontamination of vehicles, tools, and personnel.

4. **Purchase and Maintenance of Soil Removal and Transportation Equipment--** Equipment for removal and transportation use for small to medium size individual property owner projects may be purchased and maintained by the MCHD. If purchased, equipment for transportation use and small projects would be housed at the discretion of the MCHD and encouraged for public use when removing and transporting contaminated soil. Types of equipment available could include a truck, a small trailer, shovels, and disposal containers.

5. **Purchase and Maintenance of Clean Fill Soil--**The property or the access and use of property containing clean fill or access to clean fill may be purchased and maintained by the MCHD. If purchased, the clean fill would be for individual property owner's use in small projects that are not professionally contracted. The public would be encouraged to use the fill which would be either free of charge or available at cost. If available, the free hauling equipment may be used to transport the clean fill. Education on the benefits of using clean fill and how to identify potentially contaminated fill may also be distributed and posted at the clean fill site.

6. **Promotion and Dissemination of Educational Materials--**The MCHD will promote and disseminate educational materials to encourage public engagement in and use of the Voluntary Institutional Control Plan (VICP). Educational materials and programs for the encouragement of lead contamination management may be promoted through local radio, newspapers, signs, leaflets or other means as the MCHD deems appropriate. Educational materials may be disseminated through pamphlets, computer applications, booklets, group instruction or other means as the MCHD deems appropriate.

7. **Establishment of a Soil Screening Program**--The MCHD will screen soil upon request of a property owner or if blood level testing suggests the potential for lead soil contamination. The MCHD will have available to them an XRF machine capable of screening for lead soil contamination. MCHD will employ at least one person certified to use the XRF machine

and screen for lead contaminants in the soil. Screenings will be free to Madison County residents. The screening results will indicate if there is a need for additional soil analysis. Additional soil testing and analysis would be through private companies at the expense of the property owner. All soil screening sampling and testing will be conducted using United States Environmental Protection Agency (EPA) approved methods.

8. **Access to Voluntary Institutional Control Plan (VICP) Information—** All Madison County, Missouri VICP information, including guidelines, educational materials and listing of support resources can be accessed at the Madison County Health Department (MCHD). If available, written materials can be inspected and copied at cost at the MCHD. Inquiries regarding the acquisition of contaminant management education materials and the use of support resources may be made to the MCHD. The MCHD address is 806 West College Avenue, Fredericktown, MO 63645-1308. The phone number is 573-783-2747.

SUBJECT: County Health Department's Role	PART: Administrative Framework
	SECTION: 1.9
REFERENCES	EFFECTIVE:
	Revisions: October 2013

COUNTY HEALTH DEPARTMENT'S ROLE IN VICP

At present, the Madison County Health Department manages the oversight of the institutional controls. The health department has created a digging assistance and education plan. The plan calls for county residents to call **1-800-Dig-Rite** before beginning **ANY** digging project, including, but not limited to, the digging of gas lines, telephone cables, electric cables, sewer lines, water lines, fiber optic cables, gardening, landscaping, post holes, mailbox holes, sidewalks, driveways, and foundations. Calling 72 hours (three working days—Monday through Friday) before starting a project ensures that a request will be made for a County Health Department representative to discuss VICP information relative to the property and the digging project.

The representative can also visit the property, screen soil for lead levels, show any remediation and/or previously labeled digging included on the EPA database map, mark site conditions, and discuss the best practices appropriate for use with your project. Furthermore, the representative can also direct you to the current repository site, explain hauling regulations, and discuss clean fill and barrier options. The representative can also answer questions regarding soil conditions and use of best practices.

Lastly, the representative can revisit the property after the project is finished to screen any remaining soil that should be hauled to the county repository and update the digging project area on the EPA database map (and the resident's copy) so property information is accurate.

SUBJECT: Terms and Definitions	PART: Administrative Framework
	SECTION: 1.10
REFERENCES	EFFECTIVE:
	Revisions: January 2014

TERMS & DEFINITIONS

The list below contains the terms and definitions used throughout our contamination management guidelines as it applies to the VICP. These terms and definitions are intended to assist residents and all those working on soil disturbance and removal activities in understanding the methods which will prevent lead contamination, exposure, and migration in their activities. Any questions concerning a term, definition, or their use in a guideline or educational material may be directed to the Madison County Health Department (MCHD) at 573-783-2747.

1. **Agricultural/Wooded Parcels:** Any parcel of land in Madison County outside of city limits that is not within 100 feet of a dwelling or does not have a commercial business located on it.

2. **Barrier:** Any structure, material, or mechanism which physically separates satisfactory soil from contaminated soil or chat and breaks the pathway of exposure to humans. This includes walls, floors, ceilings, clean soil, asphalt, concrete, fences, or other structures intended to prevent access and exposure to contaminants by humans.

3. **Best Practices:** An activity involving soil disturbance, including excavation, building development, construction, renovation, and grading; contaminant transportation, including soil and chat; and land usage, including agriculture and recreation; which manages contamination migration and/or limits human exposure to contaminants in the air, soil and water.

SUBJECT: Terms and Definitions	PART: Administrative Framework
	SECTION: 1.10
REFERENCES	EFFECTIVE:
	Revisions: January 2014

4. **Breaching:** A break, rupture, opening, or penetration of soil or protective barriers which may expose contaminants to humans or to the environment.

5. **Building Renovation:** Construction activity to be performed on any structure involving disturbance of soil.

6. **Clean Fill:** Soil containing less than 240 parts per million (ppm) lead, 22ppm arsenic, 25ppm cadmium, and 1800ppm manganese used as an earthen materials barrier.

7. **Commercial Property**: Any land in Madison County that has a commercial building, which is not being used as a residence, located on it.

8. **Contaminants:** A contaminant is an unwanted substance in the environment. Lead is the dominant contaminant in Madison County. Soil containing lead in excess of 400 ppm is considered contaminated due to its harmful effect on human health.

9. **Contaminated Soil**: Soil containing over 400 ppm, but less than 1500 ppm lead. This soil is considered to contain lead levels which could pose a risk to human health, but is not considered hazardous waste for the purposes of hauling within Madison County.

10. **County Repository Site:** A designated area that is maintained by the county for citizens to use to dispose of lead contaminated soil.

11. **Developers of Property in Madison County:** Any person, partnership, or corporation developing property within the boundaries of Madison County, Missouri.

12. **Disposal:** The placement of contaminated media into an authorized permanent repository.

SUBJECT: Terms and Definitions	PART: Administrative Framework
	SECTION: 1.10
REFERENCES	EFFECTIVE:
	Revisions: January 2014

13. **Disturbance:** A physical change to soil or other protective barrier due to excavation, construction, renovation, removal, and/or transportation activities which may expose contaminants to humans or to the environment.

14. **EPA:** The United States Environmental Protection Agency.

15. **Excavation:** Any means of digging or disturbing soil or other protective barriers capable of resulting in exposing contaminations to humans, the environment, or spreading contamination to other locations.

16. **Hazardous Soil**: Soil containing 1500 ppm or more of lead and is considered hazardous waste for the purpose of disposal and transport within Madison County unless additional testing is conducted per DNR regulations and determines otherwise.

17. **Large Project:** A project that involves the displacement of more than one cubic yard of material (approximately three large wheel barrels full) at an individual residential property or one individual building with multiple residential dwellings and property. Large projects include, but are not limited to, new building construction, demolition of existing buildings, construction of planned unit developments (and the infrastructure necessary to serve them), and construction within and maintenance of rights-of-way.

18. **Madison County Mines Superfund Site:** Madison County in it's entirety is designated a Superfund Site.

19. **MCHD:** Madison County Health Department.

20. **Multiple Building Development/Renovation Projects** – a project that includes more than one building or multiple residence dwellings development or renovation, multiple building developments and renovations, and utility work covering multiple properties. Multiple Building Development/Renovation Projects can include, but are not limited to, construction of a multiple building senior citizen complex, renovation of a

multiple building apartment complex, burying of fiber optic cable across multiple properties.

21. **ppm:** Parts per million (measurement of metals in soil). Equivalent to milligrams per kilogram or mg/kg.

22. **Property Owner:** Any person, partnership, or corporation having ownership, title, or dominion over property within the boundaries of Madison County, Missouri.

23. **Recreational Area** – Any land in Madison County that has been developed as a place of leisure or entertainment and has the potential of being frequently visited by children or large groups of people. Examples include ball parks, playgrounds, and outdoor theaters

24. **Repository:** Area designated as a permanent authorized location for disposal of contaminated soil and mine waste.

25. **Residential Property:** Any land in Madison County that is within a one hundred (100) feet perimeter of a dwelling or multiple family dwelling, public high use areas, and child high use areas including, but not limited to, daycares, schools, parks, recreation grounds, and sports fields.

26. **Satisfactory Soil**: Soil containing 400 ppm or less. This soil is not considered to contain lead levels that would affect human health.

27. **Small Project:** A project that involves the disturbance or removal of contaminated soil less than or equal to one cubic yard (approximately the amount of soil to fill three large wheel-barrows).

28. **Temporary Demarcation Barrier:** Any physical structure, material or mechanism which visually separates the pathway between contaminants and humans. These are present in the subsurface at EPA remediated residential properties where contaminated soil still remains at depth beneath clean fill

and topsoil (typically 1 to 2 feet beneath the ground surface). Demarcation barriers may be plastic sheeting, wooden sheeting, or other barriers deemed suitable by the Madison County Health Department (MCHD).

29. **VICP:** The Voluntary Institutional Controls Plan for Madison County, Missouri .

SUBJECT:	PART: Best Practices
Best Practices	SECTION: 2.1
REFERENCES	EFFECTIVE:
	Revisions: October 2013

GENERAL BEST PRACTICES ADOPTED FOR USE IN MADISON COUNTY

The best practices described in this manual are intended to assist residents and all those working on soil disturbance and removal activities to lessen contaminant migration.

Use of best practices will enable Madison County residents, property owners, and developers of property in Madison County to both manage the migration of contaminants on their own property and the migration of contaminants onto adjacent property.

Any questions concerning a standard or its specific application may be directed to the Madison County Health Department (MCHD) at 573-783-2747.

SUBJECT:	PART: Best Practices
What I need to know about Digging	SECTION: 2.2
REFERENCES	EFFECTIVE:
	Revisions: January 2014

WHAT DO I NEED TO KNOW ABOUT DIGGING ON A RESIDENTIAL PROPERTY IN MADISON COUNTY?

If you dig on a residential property in Madison County, including your own, you are responsible for managing the soil in a way that does not spread lead contamination. Whenever a hole is dug, soil is moved and lead contamination has the potential for spreading onto either non-contaminated portions of the land or previously remediated property. The lead contamination could also potentially migrate onto another property.

The United States Environmental Protection Agency (EPA) will **NOT** come in and remediate property that has been re-contaminated after they cleaned it up the first time. Instead, property clean up will become the responsibility of the property owner and potentially the responsibility of any individual or company who commercially participated in the digging and/or hauling and disposal of the contaminated soil.

By following a series of steps called "best practices" outlined in this manual, you will minimize your potential for spreading lead contamination when digging, hauling, and disposing of soil in Madison County. A list of terms and definitions helpful to understanding the language used in the "best practices" is provided in Section 1.10 of this manual.

SUBJECT:	PART: Best Practices
Process Before Digging	SECTION: 2.3
REFERENCES	EFFECTIVE:
	Revisions: January 2014

PROCESS BEFORE DIGGING

Call **1-800-Dig-Rite** (1-800-344-7483) before you begin **ANY** digging project, including, but not limited to, the digging of gas lines, telephone cables, electric cables, sewer lines, water lines, fiber optic cables, gardening, landscaping, post holes, mailbox holes, sidewalks, driveways, and foundations. Call 1-800-Dig-Rite 72 hours (three working days—Monday through Friday) before the start of the digging project or soil disturbance action.

Upon calling 1-800-DIG-RITE, a request will be made for a Madison County Health Department (MCHD) representative to visit the property and discuss Voluntary Institutional Controls Plan (VICP) information relative to the property and the digging project.

The representative can screen soil for lead levels, show any remediation and/or previously labeled digging included in the United States Environmental Protection Agency (EPA) data base map, and discuss the best practices appropriate for use with your project. The representative can also answer questions you may have regarding soil conditions and use of best practices. Furthermore, the representative can also direct you to the current repository site, explain hauling regulations, and discuss clean fill and barrier options.

After the project is finished, the representative can revisit the property to screen any remaining soil and recommend best disposal practices, mark the digging project area on your copy of the property record and update the EPA data base map, so your property information is accurate. Dig Rite phone lines are open 24 hours a day, every day of the week.

Call 1-800-DIG-RITE <u>before</u> digging!

SUBJECT:	PART: Best Practices
Established Standards	SECTION: 2.4
REFERENCES	EFFECTIVE:
	Revisions: January 2014

MADISON COUNTY ESTABLISHED STANDARDS

The EPA and Missouri Department of Health and Senior Services (MDHSS) have determined cleanup goals and standards of soil lead contamination specific to Madison County. The best practices contained in this manual are based upon these standards. The soil lead standards vary depending upon the type of property. Therefore, it is important to first understand the definitions of each property type. Property types are defined as follows:

1. **Residential Property** - Any land in Madison County that is within one hundred (100) foot perimeter of a dwelling or multiple family dwelling, public high use areas, and child high use areas including, but not limited to, daycares, schools, parks, recreation grounds, and sports fields.
2. **Recreational Area** – Any land in Madison County that has been developed as a place of leisure or entertainment and has the potential of being frequently visited by children or large groups of people (ball parks, playgrounds, etc).
3. **Commercial Property** – Any land in Madison County that has a commercial building that is not being used as a residence located on it.
4. **Agricultural/Wooded Property** – Any parcel of land in Madison County outside the city limits that is not within 100 feet of a dwelling or does not have a commercial business located on it.

The Madison County VICP will use the following standards pertaining to soil lead levels:

1. Soil containing over 400 part per million (ppm) of lead in residential areas, developed recreational areas, and/or properties with high child activity will be considered a high lead level and will have recommended special guidelines for soil disturbances.

2. 1200 parts per million (ppm) or over of soil lead content in nonresidential areas and commercial properties will be considered a high lead level and will have special guidelines for soil disturbances.
3. Land used for agricultural purposes within Madison County is exempt from the VICP guidelines unless activity occurs on the land, such as soil transport off the site that is likely to result in the release or migration of lead contamination to other properties.
4. 240 parts per million (ppm) or less is the recommended safe lead content for clean fill or materials used for barrier construction.
5. Soil containing 1500 parts per million (ppm) of lead or greater is considered hazardous waste and DNR standards are required.

The following terms will be used to describe soil types pertaining to lead content throughout this manual:

1. **Satisfactory Soil**: Soil containing 400 ppm or less. This soil is not considered to contain lead levels that would affect human health.
2. **Contaminated Soil**: Soil containing over 400 ppm, but less than 1500 ppm lead. This soil is considered to contain lead levels which could pose a risk to human health, but is not considered hazardous waste for the purposes of hauling within Madison County.
3. **Hazardous Soil**: Soil containing 1500 ppm or more of lead and is considered hazardous waste for the purpose of disposal and transport within Madison County unless additional testing is conducted per DNR regulations and determines otherwise.
4. **Clean Fill**: Soil containing less than 240 parts per million (ppm) lead used as an earthen materials barrier. If your property was remediated by EPA, clean fill was used to replace contaminated/hazardous soil within one to two feet of the surface.

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SUBJECT: Established Standards	PART: Best Practices SECTION: 2.4
REFERENCES	EFFECTIVE: Revisions: January 2014

*This manual only contains information regarding soil lead concentrations and does not include information or hazards of additional element contamination such as arsenic, manganese, or cadmium.

*The best practices contained in this manual were primarily written for residential properties; however, they can also be applied to digging, hauling, and disposal of soil for commercial and agricultural properties. If digging, hauling, or disposing of soil from commercial or agricultural property, it may be helpful to consult with DNR at 573-840-9750 or EPA at 913-551-7603.

SUBJECT:	PART: Best Practices
Property Types/Soil Conditions	SECTION: 2.5
REFERENCES	EFFECTIVE:
	Revisions: January 2014

PROPERTY TYPES/SOIL CONDITIONS

There are five basic property types or soil conditions that could be found at Madison County residential properties. Before starting a soil disturbance project, a property owner/contractor should make sure he/she knows the property type, so the appropriate best practices can be followed. The five property types are as follows:

1. Soil tested and determined to contain satisfactory lead levels (400 ppm or less lead)
2. Soil that has been remediated (cleaned up by EPA) and and is not considered contaminated or hazardous
3. Soil that had been remediated down to one to two feet and then had a visual demarcation barrier placed between clean fill and the soil known to be contaminated or hazardous
4. Soil that has not been remediated but has been sampled and tested and is known to be contaminated or hazardous.
5. Soil that has not been tested and lead concentrations are unknown

How to know what property type exists at the location of the soil disturbance/project

A database exists that contains soil conditions of all properties sampled, tested, and remediated by the EPA. EPA should have also supplied the property owner, at the time, with a record of property conditions if the property was sampled, tested, and/or remediated. The VICP representative at the Madison County Health Department can access the EPA database and inform you of areas tested, not tested, and/or remediated at your project site.

SUBJECT:	PART: Best Practices
Property Types/Soil Conditions	SECTION: 2.5
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If the property has not been sampled and/or remediated by EPA, there will be no record or database entry. If this is the case, soil screening is needed to determine the condition of the soil at the soil disturbance site. The VICP program representative at the Madison County Health Department can also assist you in determining if screening is necessary and the screening process. To contact the VICP program representative call 573-783-2747.

SUBJECT:	PART: Best Practices
Definitions of Project Size	SECTION: 2.6
REFERENCES	EFFECTIVE:
	Revisions: January 2014

DEFINITIONS OF PROJECT SIZE

The best practices for soil disturbances vary depending on the planned size of soil disturbance being created. Before starting a digging project, first call 1-800-DIG-RITE and then determine the site soil conditions (Section 2.5) and determine the size of the soil disturbance or project. Soil disturbances can be classified by size as follows:

1. **Small Projects** – a project that displaces no more than one cubic yard of soil (about three large wheelbarrow loads). Some examples of small projects are post-hole digging, planting a tree or bush, small gardening projects, installing children's play equipment, and digging a mailbox post hole.
2. **Large Projects** – a project that involves one individual residential property or one individual building with multiple residential dwellings and property that displaces more than one cubic yard of soil (approximately three large wheelbarrow loads) Some examples of large projects include, but are not limited to, putting in or replacing a driveway, building a new residence, demolition of an existing structure, renovations that include excavation work, excavation work on utilities such as sewers.
3. **Multiple Building Development and/or Renovation Projects** – projects that include more than one building or multiple-residence dwellings development or renovation, multiple building development and renovations, and utility work covering multiple properties. Some examples of multiple building development and/or renovation projects include, but are not limited to, the construction of a multiple building senior housing, excavation and renovation of a multiple building apartment complex, and installation of utilities across multiple properties.

Once the project size and property type is determined, this manual can assist you in determining the best practices to use for your specific project. If further assistance

is needed or questions arise, you can call the Madison County Health Department at 573-783-2747 and the VICP program representative can assist you.

SUBJECT:	PART: Best Practices
Best Practices for Properties Tested and Determined Satisfactory	SECTION: 2.7
REFERENCES	EFFECTIVE:
	Revisions: January 2014

BEST PRACTICES FOR PROPERTIES TESTED AND DETERMINED SATISFACTORY (400 PPM OR LESS OF LEAD CONTENT IN RESIDENTIAL AREAS)

The following practices should be used when there is confirmation that the project site has already been tested and determined to contain a satisfactory soil lead content (at or less than 400 ppm in a residential area):

1. No additional best practices are needed for small or large projects as long as the following conditions are met:
    a. The soil disturbance site is within a 100 foot radius of the residence located on the property. If the project site is located beyond a 100 foot radius of the residence on the property, it may not have been tested for lead content. Please refer to Section 2.12 for best practices.
    b. The soil disturbance site will not affect material beneath or immediately adjacent to an existing cap barrier such as sidewalk, driveway, foundation, or landscaped area that was not removed during remediation efforts. If the soil disturbance does affect untested material below or adjacent to a cap barrier, please refer to Section 2.15 for best practices.
2. If the above conditions are met by your soil disturbance project, you are free to dig.
3. If additional soil is needed to fill a hole or for excavation, you should assure the soil fits the definition of "clean fill" (contains no more than 240 ppm lead). This will prevent contamination of the already known clean soil.
4. For multiple building development/renovation sites, you should work with an environmental contractor as practices vary depending on excavation methods and depths. If you are interested in learning more about federal and state licensing requirements for an environmental

SUBJECT:	PART: Best Practices
Best Practices for Properties Tested and Determined Satisfactory	SECTION: 2.7
REFERENCES	EFFECTIVE:
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contractor contact the Environmental Protection Agency at 913-551-7603 and/or Missouri Department of Natural Resources at 573-840-9750.

SUBJECT:	PART: Best Practices
Best Practices for Remediated Properties	SECTION: 2.8
REFERENCES	EFFECTIVE:
	Revisions: January 2014

BEST PRACTICES FOR REMEDIATED PROPERTIES

The following practices should be used when a soil disturbance is occurring at a property that is already known to have been tested and remediated without any barriers or visual demarcations installed (the property has been cleaned and contains clean fill/ satisfactory lead levels):

1. No additional best practices are needed for small or large projects as long as the following conditions are met:
    a. The soil disturbance site is within a 100 foot radius of the residence located on the property. If the project site is located beyond a 100 foot radius of the residence on the property, please refer to Section 2.12 for best practices.
    b. The soil disturbance site will not affect material beneath or immediately adjacent to an existing cap barrier such as sidewalk, driveway, foundation, or landscaped area that was not removed during remediation efforts. If the soil disturbance does affect untested material below or adjacent to a cap barrier, please refer to Section 2.15 for best practices.
2. If the above conditions are met by your soil disturbance project, you are free to dig.
3. If additional soil is needed to fill a hole or for excavation, you should assure the soil fits the definition of "clean fill" (contains no more than 240 ppm lead). This will prevent contamination of the already known satisfactory/remediated soil.
4. For multiple building development/renovation sites, you should work with an environmental contractor as practices vary depending on excavation methods and depths. If you are interested in learning more about federal and state licensing requirements for an environmental contractor contact the Environmental Protection Agency at 913-551-7603 and/or Missouri Department of Natural Resources at 573-840-9750.

SUBJECT:	PART: Best Practices
Best Practices for Properties Remediated with Visual Demarcation	SECTION: 2.9
REFERENCES	EFFECTIVE:
	Revisions: January 2014

BEST PRACTICES FOR PROPERTIES REMEDIATED WITH VISUAL DEMARCATION

The following practices should be used when a soil disturbance is occurring at a property that is already known to have been tested and remediated, but has contamination left beneath the clean fill or satisfactory soil and contains a visual demarcation to identify the contact zone. (The property has been remediated, but contains a visual demarcation between satisfactory and contaminated soil):

A. <u>For small or large digging projects</u>:

1. The following practices should be used when a soil disturbance is occurring on property that contains a visual demarcation. However, best practices from section 2.15 should also be applied if the soil disturbance site will affect untested materials beneath or immediately adjacent to an existing cap barrier such as sidewalk, driveway, foundation, or landscaped area.
2. Dig the clean fill or satisfactory soil, located above the visual demarcation, until the visual demarcation is reached.
3. The clean fill or satisfactory soil should be placed in a separate location and kept separately from the contaminated soil under the barrier.
4. After digging the satisfactory soil or clean fill, prepare to dig the contaminated/hazardous soil under visual demarcation. The following steps should be taken to prepare the site for temporary storage of the contaminated/hazardous soil:

    a. Identify an area of the property upon which the dug up contaminated soil will be temporarily stored. If soil is going to be hauled off site, the temporary storage area should be located within close proximity to the location where the soil will be loaded into the soil hauling vehicle.

b. Place plastic sheeting over the area of ground where the contaminated/hazardous soil will be temporarily stored. Make sure the plastic sheeting covers an area large enough to store all the soil.
c. If the soil needs to be stored overnight, for several days, or protected from weather elements such as wind or rain, it should be completely covered in plastic sheeting. Weighted material should also be used to push the sheeting down around the sides of the dirt pile. This will prevent weather elements from creating run-off or migration from the contaminated pile.

5. The contaminated soil can be dug and placed on the prepared plastic sheeting. The contaminated soil should not be mixed or stored with the clean fill or satisfactory soil.
6. If the hole is going to be filled back in, you should put the soil back in the hole in the same manner it was taken out. The contaminated soil should first be put back in the hole until the visual demarcation level is reached.
7. The visual demarcation should next be placed back on top of the contaminated soil. If degradation has occurred to the visual demarcation, it should be repaired to the original construction level.
8. If the visual demarcation needs to be completely or partially replaced, ensure that it is placed back into the precise location where the original demarcation was located. Any new materials used to repair or replace part of the original demarcation should be the same color as the remaining visual demarcation. Replacement visual demarcation barriers should be constructed with materials that will allow water to move and freely flow through it.
9. The satisfactory soil or clean fill then should be used last to finish filling the hole above the visual demarcation.
10. If additional soil is needed to fill the hole, it should meet the definition of clean fill (contain no more than 240 ppm lead).
11. If the contaminated/hazardous soil is not going to be reused to fill the hole, appropriate disposal practices should be used.
12. Please view Figure A below for additional detail.

SUBJECT:	PART: Best Practices
Best Practices for Properties Remediated with Visual Demarcation	SECTION: 2.9
REFERENCES	EFFECTIVE:
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B. <u>For multiple building development and/or renovation projects</u>:

1. Property owners should work with an environmental contractor as practices vary depending on excavation methods and depths.
2. If you are interested in learning more about federal and state certification requirements for an environmental contractor contact the Environmental Protection Agency at 913-551-7603 and/or Missouri Department of Natural Resources at 573-840-9750.

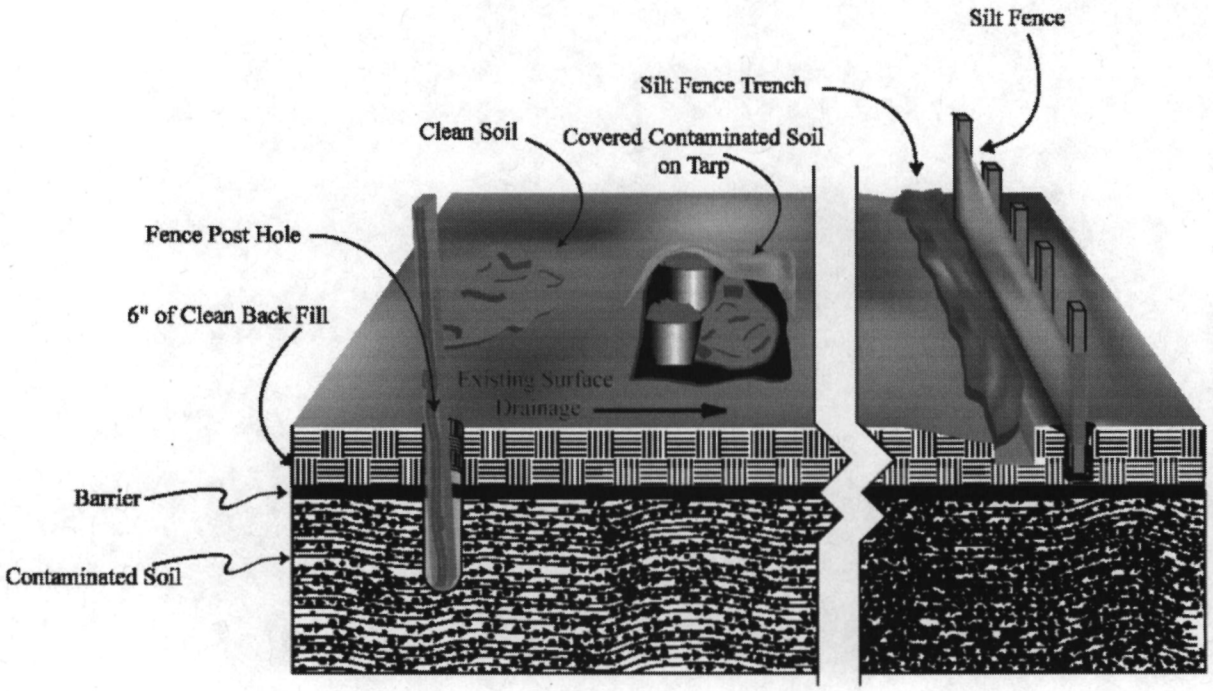

Figure A

SUBJECT:	PART: Best Practices
Best Practices for Properties Known to Contain High Soil Lead Levels with No Remediation	SECTION: 2.10
REFERENCES	EFFECTIVE:
	Revisions: January 2014

BEST PRACTICES FOR PROPERTIES KNOWN TO CONTAIN HIGH SOIL LEAD LEVELS WITH NO REMEDIATION

The following practices should be used when a soil disturbance is occurring at a property that is known to contain high soil lead concentrations, but has not been remediated (Residential property containing over 400 ppm of soil lead, but has not been cleaned):

A. For small and large projects:

1. You are allowed to dig the soil at the site, however, remember the soil is contaminated/hazardous.
2. The following steps should be taken to prepare the site for temporary storage of the contaminated/hazardous soil:

    a. Identify an area of the property upon which the dug up contaminated soil will be temporarily stored. Make sure the storage area is in a location that is also known to be contaminated and not in a satisfactory or remediated area. In order to minimize soil contamination, choose a soil storage area as near as possible to the site. If the soil is going to be hauled off site, the temporary storage site should also be located within close proximity to the location where the soil will be loaded into the soil hauling vehicle.
    b. If the soil needs to be stored overnight, for several days, or protected from weather elements such as wind or rain, it should be completely covered in plastic sheeting. Weighted material should also be used to push the sheeting down around the sides of the dirt pile. This will prevent weather elements from creating run-off or migration from the contaminated pile.

3. The contaminated soil should not be mixed or stored with the satisfactory soil or clean fill.
4. The contaminated soil can be used and moved on site, but should not be moved to an area on the property that has already been remediated or determined satisfactory.
5. The freshly excavated soil, where the soil disturbance occurred, should be either seeded or covered with straw to prevent migration of contaminants off the property. You can be held responsible for any soil contamination that migrates off the property.
6. If the soil is going to be removed from the property, proper disposal techniques should be utilized.
7. After project completion, you are encouraged to contact the EPA and discuss remediation options.

B. <u>For Multiple Building Development and/or Renovation Sites</u>:

1. Property owners should work with an environmental contractor as practices vary depending on excavation methods and depths.
2. If you are interested in learning more about federal and state licensing requirements for an environmental contractor contact the Environmental Protection Agency at 913-551-7603 and/or Missouri Department of Natural Resources at 573-840-9750.

SUBJECT:	PART: Best Practices
Best Practices for Properties Not Tested	SECTION: 2.11
REFERENCES	EFFECTIVE:
	Revisions: January 2014

BEST PRACTICES FOR PROPERTIES NOT TESTED

The following practices should be used when a soil disturbance will be occurring at a location not previously tested:

A. For small and large projects:

1. You are allowed to dig the soil at the site, however, the soil should be treated as if it is contaminated/hazardous.
2. The following steps should be taken to prepare the site for temporary storage of the dug soil:

    a. Identify an area of the property upon which the dug up soil will be temporarily stored. Make sure the storage area is not located in a known satisfactory or remediated area. If the soil is going to be hauled off site, the temporary storage area should also be located within close proximity to the location where the soil will be loaded into the soil hauling vehicle.
    b. If the soil needs to be stored overnight, for several days, or protected from weather elements such as wind or rain, it should be completely covered in plastic sheeting. Weighted material should also be used to push the sheeting down around the sides of the dirt pile. This will prevent weather elements from creating run-off or migration from the contaminated pile.

3. The soil should not be mixed or stored with the known clean fill or satisfactory soil.
4. The soil can be used and moved on site, but should not be moved to an area on the property that has already been remediated or determined satisfactory.
5. The freshly excavated soil, where the soil disturbance occurred, should be either seeded or covered with straw to prevent migration of

contaminants off the property. You can be held responsible for any soil contamination that migrates.

6. If the soil is going to be removed from the property, proper disposal techniques should be utilized. The soil should be treated as contaminated until it has been tested and verified. If screening of the soil is needed, contact the VICP program representative at the Madison County Health Department 573-783-2747.
7. After project completion, you are encouraged to call EPA at 913-551-7603 to discuss property testing and remediation if needed.

B. <u>For Multiple Building Development and/or Renovation Sites</u>:

1. You should work with an environmental contractor as practices vary depending on excavation methods and depths.
2. If you are interested in learning more about federal and state licensing requirements for an environmental contractor contact the Environmental Protection Agency at 913-551-7603 and/or Missouri Department of Natural Resources at 573-840-9750.
3. If you are beginning a new development project on undeveloped land, you should contact the EPA at 913-551-7603.

SUBJECT:	PART: Best Practices
Best Practices for Soil Disturbances Located Over 100 Feet from Residence	SECTION: 2.12
REFERENCES	EFFECTIVE:
	Revisions: January 2014

BEST PRACTICES FOR SOIL DISTURBANCES LOCATED OVER 100 FEET FROM A RESIDENCE

The following practices should be used when a soil disturbance is occurring over 100 feet from a residence (EPA remediation efforts only extend 100' from a residence. Therefore, these locations are usually going to be untested).

A. <u>For small and large projects</u>:

1. You are allowed to dig the soil at the site; however, the soil should be treated as if it is contaminated/hazardous.
2. The following steps should be taken to prepare the site for temporary storage of the dug soil:

    a. Identify an area of the property upon which the dug up soil will be temporarily stored. Make sure the storage area is not located in a known satisfactory or remediated area. In order to minimize soil contamination, chose a storage area as near as possible to the dig site. If the soil is going to be hauled off site, the temporary storage area should also be located within close proximity to the location where the soil will be loaded into the soil hauling vehicle.
    b. If the soil needs to be stored overnight, for several days, or protected from weather elements such as wind or rain, it should be completely covered in plastic sheeting. Weighted material should also be used to push the sheeting down around the sides of the dirt pile. This will prevent weather elements from creating run-off or migration from the contaminated pile.

3. The soil should not be mixed or stored with the known clean fill or satisfactory soil.

SUBJECT:	PART: Best Practices
Best Practices for Soil Disturbances Located Over 100 Feet from Residence	SECTION: 2.12
REFERENCES	EFFECTIVE:
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4. The soil can be used and moved on site, but should not be moved to an area on the property that has already been remediated or determined satisfactory.
5. The freshly excavated soil, where the soil disturbance occurred, should be either seeded or covered with straw to prevent migration of contaminants off the property. You can be held responsible for any soil contamination that migrates.
6. If the soil is going to be removed from the property, proper disposal techniques should be utilized. The soil should be treated as contaminated until it has been tested and verified. If screening of the soil is needed, contact the VICP program representative at the Madison County Health Department 573-783-2747.
7. After project completion, you are encouraged to call EPA at 913-551-7603 to discuss property testing and remediation if needed.

B. <u>For Multiple Building Development and/or Renovation Sites</u>:

1. You should work with an environmental contractor as practices vary depending on excavation methods and depths.
2. If you are interested in learning more about federal and state licensing requirements for an environmental contractor contact the Environmental Protection Agency at 913-551-7603 and/or Missouri Department of Natural Resources at 573-840-9750.
3. If you are beginning a new development project on undeveloped land, you should contact the EPA at 913-551-7603.

SUBJECT:	PART: Best Practices
Best Practices for New Development Projects	SECTION: 2.13
REFERENCES	EFFECTIVE:
	Revisions: January 2014

BEST PRACTICES FOR NEW DEVELOPMENT PROJECTS

The following practices should be applied when a new residential or a new multiple building development/renovation projects are being developed in an area that has not been previously identified as residential or developed:

A. For small and large projects:

1. You are allowed to dig the soil at the site; however, the soil should be treated as if it is contaminated/hazardous.
2. The following steps should be taken to prepare the site for temporary storage of the dug soil:

    a. Identify an area of the property upon which the dug up soil will be temporarily stored. Make sure the storage area is not located in a known satisfactory or remediated area. If the soil is going to be hauled off site, the temporary storage area should also be located within close proximity to the location where the soil will be loaded into the soil hauling vehicle.
    b. If the soil needs to be stored overnight, for several days, or protected from weather elements such as wind or rain, it should be completely covered in plastic sheeting. Weighted material should also be used to push the sheeting down around the sides of the dirt pile. This will prevent weather elements from creating run-off or migration from the contaminated pile.

3. The soil should not be mixed or stored with the known clean fill or satisfactory soil.
4. The soil can be used and moved on site, but should not be moved to an area on the property that has already been remediated or determined satisfactory.

5. The freshly excavated soil, where the soil disturbance occurred, should be either seeded or covered with straw to prevent migration of contaminants off the property. You can be held responsible for any soil contamination that migrates.
6. If the soil is going to be removed from the property, proper disposal techniques should be utilized. The soil should be treated as contaminated until it has been tested and verified. If screening of the soil is needed, contact the VICP program representative at the Madison County Health Department 573-783-2747.
7. After project completion, you are encouraged to call EPA at 913-551-7603 to discuss property testing and remediation if needed.

B. <u>For Multiple Building Development and/or Renovation Sites</u>:

1. You should work with an environmental contractor as practices vary depending on excavation methods and depths.
2. If you are interested in learning more about federal and state licensing requirements for an environmental contractor contact the Environmental Protection Agency at 913-551-7603 and/or Missouri Department of Natural Resources at 573-840-9750.
3. If you are beginning a new development project on undeveloped land, you should contact the EPA at 913-551-7603.

SUBJECT:	PART: Best Practices
Best Practices for Gardening Projects/Special Projects	SECTION: 2.14
REFERENCES	EFFECTIVE:
	Revisions: January 2014

BEST PRACTICES FOR GARDENING PROJECTS/SPECIAL PROJECTS

A. Gardening Areas

It is important to utilize the following practices when developing a garden area as lead contamination in a garden area has a potential for creating health risks. Some fruits and vegetables can absorb lead contained in soil. The lead then can be absorbed into the body when those fruits and vegetables are eaten. Children, pregnant women, and unborn children are at the highest risk for absorption of lead. The following practices should be utilized when developing a garden area:

1. If the garden area is located on property that has already been remediated by the EPA, it will be suitable for gardening with no further action needed.
2. If the garden area is located on property that has not been tested or remediated, it may not be suitable for gardening. You should use twenty-four inches of clean fill (240 ppm lead or less) to cover the gardening area before planting.
3. If you are unsure if the garden area property has been tested and/or remediated, you can contact the VICP program representative at the Madison County Health Department 573-783-2747.

B. Children's Sand/Dirt Play Areas

It is also important to include the following practices for children's play areas such as sand and dirt boxes as children are highly susceptible to lead contamination. The following are best practices recommended for children's sand/dirt play areas:

1. If the dirt/sand is part of or from an area remediated by the EPA, it will be suitable for children's play area.

SUBJECT:	PART: Best Practices
Best Practices for Gardening Projects/Special Projects	SECTION: 2.14
REFERENCES	EFFECTIVE:
	Revisions: January 2014

2. If the dirt/sand is not on or from an area remediated by the EPA, it may not be suitable for children. The recommended standard for children's dirt and sand play areas is 240 ppm or less lead content. If you need an area screened for lead content, you can call the VICP program representative at the Madison County Health Department 573-783-2747.
3. If you are purchasing new sand or dirt for a children's play area, make sure the quarry/seller can verify that it meets the definition of clean fill (less than 240 ppm lead).

SUBJECT:	PART: Best Practices
Best Practices for Working with Barriers	SECTION: 2.15
REFERENCES	EFFECTIVE:
	Revisions: January 2014

BEST PRACTICES FOR WORKING WITH BARRIERS

For purposes of the Madison County VICP, barriers are any physical structure, material, or mechanism which breaks the pathway between contaminated/hazardous soil and human exposure. Barriers can be permanent or temporarily put in place during construction activities. The primary purpose of a barrier is to prevent the migration of contaminated soil.

The following are some examples of materials that may be used as barriers:

1. Clean fill (240 ppm or less lead content)
2. Crushed Gravel (240 ppm or less lead content)
3. Asphalt
4. Concrete
5. Fences
6. Plastic Sheeting
7. Wooden Sheeting

Driveways, sidewalks, patios, and parking lots are considered barriers to soil contamination as the concrete or asphalt keeps the potentially contaminated soil from moving to the surface.

Barriers can be placed between contaminated/hazardous soil and satisfactory soil/clean fill or they can be used to cover or cap contaminated/hazardous soil. Either option will prevent the migration of contaminated soil.

The following practices should be followed when working with barriers:

1. Cap barriers, such as older concrete driveways or sidewalks, have a potential for containing lead contaminants within their own makeup. Therefore, it is important to take precautionary measures to prevent lead contamination at the site when degradation or replacement of a cap

barrier occurs. It may also be necessary to follow recommended disposal practices when replacement or destruction of a cap barrier occurs.

2. Maintain existing barriers. If degradation occurs during excavation or due to natural elements, repair the barrier to the original construction level sufficient to manage the migration of contamination.
3. Use temporary barriers during excavation or project construction (Ex: place contaminated/hazardous soil on plastic sheeting).
4. Cap barriers such as concrete and asphalt need maintenance and repair in case of degradation. If degradation occurs, the cap barrier should be repaired as needed to prevent contaminated/hazardous soil from breaching the surface.
5. If you are digging up a cap barrier such as a driveway, sidewalk, patio, or parking lot, the best practice to prevent soil lead contamination is to replace it with a new one. Remember the existing cap barrier itself could contain lead contaminants. The replacement driveway, sidewalk, patio, or parking lot, should cover the entire exposed area of the original cap barrier.
6. Areas under cap barriers such as sidewalks, driveways, and foundations were not tested by EPA during initial remediation efforts, therefore, these areas and exposed materials such as soil or chat could contain lead contamination. If the soil conditions are unknown after a barrier is dug up or the material beneath the dug up barrier remains exposed, it is recommended to have the exposed soil screened, contact the VICP program representative at the Madison County Health Department 573-783-2747.

SUBJECT:	PART: Best Practices
Best Practices for Proper Cleanup	SECTION: 2.16
REFERENCES	EFFECTIVE:
	Revisions: January 2014

BEST PRACTICES FOR PROPER CLEAN UP

Proper clean up after working in contaminated soil is important to prevent lead contamination from spreading into your home or migrating onto uncontaminated areas of your property or neighboring properties. Remember, you are responsible for any migrating soil contamination. The following practices should be used after digging or working in contaminated/hazardous soil:

1. If the soil exceeds 400 ppm lead, or if the concentration of lead in the soil is unknown, either reseed or place straw over the freshly excavated soil.
2. Dispose of containment materials, such as temporary barrier materials, in a covered trash receptacle.
3. Wash all tools to rid them of contaminated soil. Make sure not to wash the tools in an area that has been determined to be satisfactory or remediated.
4. Take off shoes before entering the inside of a residence. Shoes should then be washed or cleaned with a damp cloth.
5. Wash your hands and face or shower directly after entering a residence.
6. Wash your clothes separately from other clothes.

SUBJECT:	PART: Best Practices
Best Practices for Natural Disaster	SECTION: 2.17
REFERENCES	EFFECTIVE:
	Revisions: February 2014

BEST PRACTICES FOR NATURAL DISASTER

The devastation from a natural disaster can be overwhelming in many aspects. Natural disasters not only create physical damage, but can also spread or expose environmental contamination such as lead. For example, tornados, floods, and wind storms can cause potentially contaminated sediment to accumulate when wind or water displaces sand, silt, or soil. Fires can produce ash that contains lead. Fires, tornados, and floods can also expose foundations or chat that contains lead contaminants. Furthermore, debris from the disaster may also contain lead contaminants.

Every natural disaster poses its own unique challenges and potential for the spread of contaminants. Therefore, it is recommended that if you encounter damage or destruction from a natural disaster, such as tornado, wind storm, flood, or fire, you contact the Madison County Health Department's VICP program representative prior to clean up or recovery from the disaster for further direction and recommended best practices to prevent the migration of contaminants.

SUBJECT:	PART: Disposal & Hauling
Cover Page	SECTION: 3.0
REFERENCES	EFFECTIVE:
	Revisions: October 2013

Madison County Voluntary Institutional Controls Manual

Section 3 Disposal & Hauling

SUBJECT:	PART: Disposal & Hauling
Introduction and Definitions	SECTION: 3.1
REFERENCES	EFFECTIVE:
	Revisions: January 2014

DISPOSAL & HAULING

The Missouri Department of Natural Resources (DNR) regulates the hauling and disposal of contaminated soils. The DNR normally requires contaminated soil to be tested by a laboratory to determine if it is hazardous before it can be transported. However, DNR is permitting the use of an alternate testing option for Madison County. DNR is allowing soil in Madison County to be screened using an XRF for initial determination of soil lead concentrations. THIS ALLOWANCE ONLY APPLIES TO HAULING LEAD CONTAMINATED SOIL IN MADISON COUNTY. Therefore, Madison County residents can call the VICP program representative at the Madison County Health Department 573-783-2747 to have remaining project soil screened (if lead content is unknown) for disposal and hauling recommendations.

Any contaminated soil that it going to be transported off a dig site should be screened by the VICP program representative from the Madison County Health Department so the proper disposal and transport guidelines can be implemented. The VICP program representative will take samples of the remaining project soil and screen the soil by averaging three readings from an XRF.

Disposal practices for project soil vary depending upon the lead content of the soil. For disposal and hauling purposes, soil can be classified in three categories:

1. **Satisfactory Soil** – Soil containing 400 ppm or less lead. This soil is not considered to contain lead levels that would affect human health.
2. **Contaminated Soil** – Soil containing over 400 ppm lead but less than 1500 ppm lead. This soil is considered to contain lead levels which could pose a risk to human health, but is not considered hazardous waste for the purposes of hauling within Madison County.

3. **Hazardous Soil** – Soil containing 1500 ppm lead or greater. This soil poses considerable risk to human health if ingested. Hazardous soil should only be hauled by a licensed hazardous waste hauler.

All Madison County soil containing more than 400 ppm lead that has been excavated **shall be** disposed of using Madison County Best Practices found in the Disposal and Hauling section of this manual.

The encouraged practice for disposal of all soil containing over 400 ppm lead is for it to be hauled to the Madison County repository site.

SUBJECT: Disposal and Hauling Practices for Satisfactory Soil	PART: Disposal & Hauling SECTION: 3.2
REFERENCES	EFFECTIVE: Revisions: January 2014

DISPOSAL & HAULING PRACTICES FOR SATISFACTOY SOIL

The following practices should be followed when disposing or transporting satisfactory soil. Satisfactory soil is defined as project soil containing 400 ppm or less lead that is not expected to affect human health.

1. Satisfactory soil can be used or stored at any location on the site.
2. Satisfactory soil can be transported without further recommendations or guidelines.
3. If satisfactory soil is mixed with contaminated and/or hazardous soil, it should be treated as contaminated or hazardous.

SUBJECT: Disposal and Hauling Practices for Contaminated Soil	PART: Disposal & Hauling SECTION: 3.3
REFERENCES	EFFECTIVE: Revisions: January 2014

DISPOSAL & HAULING PRACTICES FOR CONTAMINATED SOIL

The following practices should be followed when disposing or transporting contaminated soil. Contaminated soil is defined as project soil containing over 400 ppm lead, but less than 1500 ppm lead. This soil is considered to contain lead levels which could pose a risk to human health, but is not considered hazardous waste for the purposes of hauling and disposal within Madison County.

1. The recommended best practice for disposal of contaminated soil is for it to be hauled to the Madison County repository site.
2. Small Digging Projects – This is the only exception to hauling contaminated soil to the repository site, since the amount of soil left over from a small digging project will be minimal. You will be permitted to dispose of the contaminated soil on the originating property as long as the following conditions are met:

    a. The soil must be disposed in an area that remains contaminated at the surface.
    b. The disposal area is a minimum of 100' away from a residence.
    c. You should be aware that you could be held responsible for any soil contamination migrating off the property.
    d. The disposed of soil should be either seeded or covered with straw to prevent the migration of contaminants off the property.

3. Small amounts of soil may be transported to the Madison County repository in buckets containing lids.

SUBJECT:	PART: Disposal & Hauling
Disposal and Hauling Practices for Contaminated Soil	SECTION: 3.3
REFERENCES	EFFECTIVE:
	Revisions: January 2014

4. Contaminated soil can also be transported to the repository using a pickup truck or other transport vehicle. The following practices should be followed when using a vehicle to haul contaminated soil:

    a. Only vehicles with a working tail gate or some other type of back end bed closure should be used to haul contaminated soil.
    b. After the contaminated soil is placed into the bed of the vehicle, the transporter should make sure to cover and secure the soil. This can be done by covering the contaminated soil with plastic sheeting. If the bed is not completely enclosed, the plastic sheeting should be either weighed down or tied to the sides of the bed to assure the contaminated soil does not become airborne during transport.
    c. After disposal of the soil, the transporter should thoroughly sweep out the remnant soil from the bed of the transport vehicle while still at the repository site.

5. Failure to follow these guideline could result in enforcement action by the DNR.

SUBJECT: Disposal & Hauling Practices For Hazardous Soil	PART: Disposal & Hauling SECTION: 3.4
REFERENCES	EFFECTIVE: Revisions: October 2013

DISPOSAL & HAULING PRACTICES FOR HAZARDOUS SOIL

The following practices should be used for the disposal and hauling of hazardous soil. Hazardous soil is defined as project soil containing at or over1500 ppm lead. This soil poses a considerable risk to human health if ingested.

1. Soil containing 1500 ppm or greater lead is considered hazardous waste for the purposes of disposal and hauling within Madison County unless additional testing is conducted per DNR regulations and it is determined otherwise.
2. A licensed hazardous waste hauler should be used to assure all applicable regulations in transportation and disposal of hazardous wastes are followed
3. Failure to follow the best practices for disposal and hauling or hazardous soil could result in enforcement action by the DNR.

SUBJECT:	PART: Disposal & Hauling
Contact Numbers	SECTION: 3.5
REFERENCES	EFFECTIVE:
	Revisions: October 2013

CONTACT NUMBERS

1. U.S. E.P.A. Region 7 Project Manager for Madison County:
   Dan Kellerman—Office: 913-551-7603

2. Mo. Dept. of Natural Resources Project Manager for Madison County:
   Evan Kifer—Office: 573-751-1990

3. Mo. Dept. of Natural Resources Southeast Regional Office:
   Poplar Bluff, MO—Office 573-840-9750

4. Mo. Dept. of Natural Resources Hazardous Waste Program's Compliance and Enforcement Section:
   Regarding the transportation of hazardous waste: 573-751-7560

5. Madison County Health Department:
   Regarding roundtable information meeting schedule, lead health and safety information, or lead testing for children: 573-783-2747

6. The Southeast Regional Office of MDNR also has a website that lists compliance information and certified hazardous waste haulers (http://www.dnr.mo.gov/asp/hwp/transporter/trans-list.asp) This local site is different from the state DNR website.

SUBJECT:	PART: Training Exam
Cover Page	SECTION: 4.0
REFERENCES	EFFECTIVE:
	Revisions: October 2013

Madison County Voluntary Institutional Controls Manual

Section 4 Training Exam

SUBJECT:	PART: Training Exam: Education for Professionals Engaged in Excavation, Hauling and Disposal of Lead Contaminated Soil
Training Exam	SECTION: 4.1
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: January 2014

Madison County Voluntary Institutional Controls Professional Training Exam (Excavation, Hauling, and Disposal of Lead Contaminated Soil)

SECTION A:

MULTIPLE CHOICE: Circle the letter of the best response for each question.

1) The processing and smelting of lead in Madison County left MAJOR areas of elevated levels of lead and other heavy metals which we now know pose a threat to human health and the environment. The mine waste contaminated...
   a. soil
   b. sediment
   c. surface water
   d. groundwater
   e. all of the above

2) Much of the property in Madison County contains some lead contamination because...
   a. lead mining sites existed on all the land of Madison County
   b. lead waste was spread by natural modes of transportation (water, wind)
   c. lead waste was spread by human modes of transportation
   d. both b and c
   e. all of the above

3) In 2003, Madison County was named a Superfund site because of the following conditions...
   a. health department studies concluded that some children in Madison County had elevated levels of lead in their blood
   b. the presence of mine waste piles
   c. EPA conducted removal actions in Harmony Lake, Fredericktown, and in child-sensitive population areas
   d. water sampling determined that metals concentrations exceeded the Missouri Department of Natural Resources aquatic life standards

e. all of the above

4) Once EPA remediates Madison County's properties, EPA mandates that a management plan (usually called institutional controls) be put in place so that the land does not get re-contaminated. These plans...
   a. are based on local, state, and federal contamination management laws
   b. reflect the unique needs and requirements of Madison County
   c. focus only on digging and disposal of soil
   d. both a and b
   e. all of the above

5) The contamination management methods to be used as institutional controls are referred to as...
   a. Best Practices
   b. Ordinances
   c. Regulations
   d. both a and b
   e. all of the above

6) Madison County's contamination management plan is called the Voluntary Institutional Controls Plan or VICP. The word, "voluntary" in the title means...
   a. residents may choose to use the plan or not without any authoritative oversight by EPA and/or DNR
   b. there are no local ordinances overseeing the digging, hauling, and disposal of soil
   c. both a and b
   d. authoritative oversight from EPA and DNR exist regarding soil disturbance activities that re-contaminate remediated land
   e. both b and d

7) If you engage in excavation, hauling, and/or disposal activities in Madison County...

a. you are responsible for managing the soil in a way that does not spread lead contamination
b. you could be held accountable for future cleanup needed because of re-contamination from your activities
c. lead contaminated soil could migrate onto non-contaminated soil
d. both a and c
e. all of the above

8) The Madison County Health Department has created a digging assistance and education plan. The assistance call number for this plan is
a. 1-573-783-2747
b. 1-800-DIG-RITE
c. 1-800-HEALTHY
d. 1-913-551-7603
e. 1-800 DIG-SOIL

9) Once you have made the assistance call, the health department representative can...
a. screen soil for lead levels
b. show any remediation and/or previously labeled digging included on the EPA database map
c. discuss the best practices appropriate for use with your project
d. direct you to the current repository site
e. all of the above

10) According to the VICP, a "barrier" can be...
a. any physical structure, material or mechanism which breaks the pathway between contaminants and humans
b. concrete or asphalt
c. soil containing more than 240 ppm lead
d. both a and b
e. all of the above

SUBJECT:	PART: Training Exam: Education for Professionals Engaged in Excavation, Hauling and Disposal of Lead Contaminated Soil
Training Exam	SECTION: 4.1
REFERENCES	EFFECTIVE: October 1, 2012
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11) One of the VICP resources is a soil repository site for use by county residents. The soil repository is used to...
   a. dispose of soil containing equal to or more than 240 ppm lead but less than 1500 ppm lead
   b. dispose of soil containing more than 400 ppm lead but less than 1500 ppm lead
   c. dispose of soil containing equal to or more than 1500 ppm lead
   d. dispose of soil containing any amount of lead
   e. both c and d

12) The following best practices should be used for soil containing less than 1500 ppm lead:
   a. soil should be disposed of at the repository during daylight hours
   b. the exterior of the hauling vehicle should be kept as free from soil as possible
   c. clothes worn during the hauling should be washed separately from other clothes
   d. both a and b
   e. all of the above

13) Based on sampling conducted in Madison County by the EPA, DNR is allowing testing using an XRF to make an initial determination of whether additional testing should be conducted.
   a. This allowance only applies to hauling lead contaminated soil in St. Francois and Madison Counties
   b. This allowance only applies to the State of Missouri
   c. This allowance only applies to Madison County
   d. This allowance only applies to lead testing in the United States
   e. This allowance only applies to Superfund sites with lead contamination

14) What level is considered hazardous waste according to DNR standards for hauling and disposal of soil?
   a. soil containing less than 1500 ppm lead"
   b. soil containing 1500 ppm or more lead
   c. soil containing less than 1200 ppm
   d. soil containing 1300 ppm lead
   e. none of the above"

15) If soil has high enough concentrations of lead to be defined as "hazardous waste", regulations state...
   a. the soil must be disposed of at the county soil repository
   b. a licensed hauler must haul and dispose of the soil
   c. records of the hauling should be filed with the health department
   d. both a and b
   e. all of the above

16) VICP best practices state that "satisfactory soil" that cannot fit back into the excavated site....
   a. can be left on the property
   b. should be disposed of at the county repository site
   c. can be mixed with contaminated soil and left on the property
   d. both a and c
   e. none of the above

17) VICP hauling best practices state that hauling vehicles should...
   a. should contain a working tailgate or backend closure
   b. should cover the soil so the soil cannot easily become airborne
   c. should be swept out at the repository site once soil has been dumped
   d. both a and b
   e. all of the above

18) VICP best practices state that in order to figure out what soil conditions exist on a remediated or previously developed property you should...
   a. test the soil for lead contamination and report your findings to the health department
   b. call EPA for property information
   c. call 1-800-DIG RITE
   d. call DNR for a site inspection
   e. none of the above

19) In order to prepare a small projects excavation site for the digging and temporary storage of contaminated soil, VICP best practices state you should...
   a. identify the area of property upon which the dug up contaminated soil will be temporarily stored
   b. place plastic sheeting over the storage area or use other suitable temporary barrier for storage
   c. enclose the excavation and storage area with a temporary fence
   d. both a and b
   e. all of the above

20) An orange mesh barrier located approximately two feet under the soil is the sign that...
   a. soil containing lead that is considered contaminated with lead lies below it
   b. soil with less than 400 ppm lead lies below it
   c. you are free to dig without using any best practices below it
   d. both b and c
   e. both a and c

21) The definition, "Soil containing less than 240 parts per million (ppm) lead, refers to which term?

a. hazardous soil
b. clean fill
c. contaminated soil
d. barrier
e. satisfactory soil

22) After any project, the EPA database map should be updated with the following information...
a. specific location and depth of project
b. date project occurred
c. names of all employees working on the project
d. both a and b
e. all of the above

23) Since hazardous waste issues can be larger and more complex when working on sites containing multiple buildings VICP best practices recommend...
a. only professional contractors work on them
b. only companies licensed to handle and/or haul "hazardous waste" work on them
c. only contractors residing in Madison County work on them
d. only companies who have participated in the VICP professional training work on them
e. none of the above

1. 24) The definition, "Soil containing over 400 ppm, but less than 1500 ppm lead. This soil is considered to contain lead levels which could pose a risk to human health, but is not considered hazardous waste for the purposes of hauling within Madison County" refers to what term?

a. clean fill
b. contaminated soil
c. barrier
d. satisfactory soil
e. none of the above

SECTION B:

TRUE/FALSE: For each of the following statements, answer True or False.

1) VICP hauling best practices state, if transporting small amounts of soil (a few buckets worth) containing less than 1500 ppm lead, buckets covered with lids may be used.

2) If hauling contaminated soil in a pickup, best practices state that the truck should have a tailgate or enclosed back end and that the soil should be covered to lessen the opportunity for the soil to become airborne.

3) "Clean fill" is defined in the VICP as soil containing less than 400 ppm lead, 22 ppm arsenic, 25 ppm cadmium, and 1800 ppm manganese.

4) "Large Project" is defined in the VICP as a project that involves one individual residential property or one individual building with multiple residential dwellings and property and that displaces less than one cubic yard of soil.

5) Residential property is defined as, "Any land in Madison County that is within a one hundred foot perimeter of a dwelling or multiple family dwelling, public high use areas, and child high use areas.

6) Soil that has been found to contain no more than 400 ppm lead is not considered "contaminated" nor considered "hazardous".

7) If you are working on either a small or large project and the soil tests under 400 ppm lead, you are free to dig without using any other best practices as long as the disturbance site is within 100 foot of the residence on the property and does not disturb an area near a cap barrier.

8) If a large project dig site has contaminated soil on the surface, whatever contaminated soil remains can be left at the dig site as it is a location that contains surface contamination.

9) No matter its size, any property public high use area in Madison County is considered "residential " property relative to the VICP.

10) The Madison County Superfund Site is comprised of only the northern portions of the county as this is the area where most of the metals mining operations took place.

SECTION C:

SUBJECT:	PART: Training Exam: Education for Professionals Engaged in Excavation, Hauling and Disposal of Lead Contaminated Soil
Training Exam	SECTION: 4.1
REFERENCES	EFFECTIVE: October 1, 2012
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SHORT ANSWER: Fill in the information for the following two questions regarding the digging and backfilling best practices for project sites that have a visual demarcation two feet under the soil.

1. Explain the steps to digging in a location that contains a visual demarcation two feet under the soil. Make sure you mention the visual demarcation, satisfactory soil, and contaminated soil.

2. Explain the steps to backfilling in a location that contains a visual demarcation two feet under the soil. Make sure you mention the visual demarcation, satisfactory soil, and contaminated soil.

SUBJECT:	PART: Education for School Children
Cover Page	SECTION: 5.0
REFERENCES	EFFECTIVE:
	Revisions: October 2013

Madison County Voluntary Institutional Controls Manual

Section 5 Education for School Children

SUBJECT: Lead Health and Safety Education Program	PART: Voluntary Institutional Controls Education for School Children SECTION: 5.1
REFERENCES	EFFECTIVE: October 1, 2012 Revisions: January 2014

Voluntary Institutional Controls Education for School Children-- Lead Health and Safety Education Program

General District Proposed Framework:
Intermediate Level—Lead education based on a science perspective
Middle and High School Levels—Lead education based on a historical perspective

A lead health and safety curriculum specific to Madison County, Missouri has been developed for the intermediate level of school. This curriculum provides lead health and safety information and lead health and safety experiments for instructors to use with appropriate science units. This curriculum provides instructors with local resources to teach state-mandated curriculum while also providing the school-aged children with lead health and safety information crucial to the success of the Voluntary Institutional Controls Plan. The curriculum is included in the VICP manual, and copies have been provided to the appropriate instructors within the county school districts.

A lead history resource manual has been developed for use at both the middle and high school levels. This resource manual provides news articles, academic reports, government files, and personal accounts gathered locally from the Madison County Historical Society. The educational resources give instructors information local to Madison County's lead history that they can use in partnership with the state-mandated curriculum. These individual pieces have been bound in a resource manual and provided to the appropriate instructors within the county school districts. The manual is not included in the VICP; however, a copy has been provided to the Madison County Health Department.

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Madison County Lead Health and Safety Science Curriculum Introduction and Listing of Resources	SECTION: 5.2
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: January 2014

Madison County Lead Health and Safety Science Curriculum

Curriculum Introduction and Listing of Resources

The Madison County Health Department has created a lead health and safety education program to work in partnership with the Voluntary Institutional Controls Plan (VICP) for Madison County, MO. This lead health and safety program consists of two levels of education: lead health and safety science materials for the intermediate and middle school levels, and a local lead history resource manual for the middle high school levels. For additional copies of these materials or to learn more about the VICP, please contact the Madison County Health Department at 573-783-2747.

The following resources are included as the lead science materials:

1) One manual of lead health information for teachers to present to students.
2) One rock and lead kit—this kit has different types of rocks important to the area and several forms of lead. (different ages of granite, LaMotte sandstone, transitional rock--both granite and sedimentary rock fused together, soil with chat mixed in, rock with lead and other minerals).
3) Instruction and materials list for two separate experiments:
   A) The first experiment shows the difference between lead encased in rock and the waste form, chat, and is designed to heighten awareness of soil that is defined as "hazardous" to dig in versus soil that is not defined as "hazardous" to dig in.
   B) The second experiment showcases best practices for digging in leaded soil which can lead to safer digging and cleanup activities at home.

SUBJECT: Madison County Lead Health and Safety Science Curriculum Lead Science	PART: Voluntary Institutional Controls Education for School Children SECTION: 5.3
REFERENCES	EFFECTIVE: Revisions:

Lead Science Information Manual

Geological Information Pertaining to Madison County and the "Old Lead Belt":

The St. Francois Mountains

The St. Francois Mountains are the highest and oldest rock formations contained in Missouri. The average mountain "knobs" rise to elevations between 1300-1600 feet. The highest, Taum Sauk (1772 feet), is Missouri's highest mountain.
The granite forming the St. Francois Mountains is approximately 1.5 billion years old. The granite was formed during a volcanic period of geologic activity. It was formed in a three-phase process of eruption, displacement, and compaction. Four major eruption centers have been identified: Taum Sauk, Lake Killarney, Butler Hill, and Eminence Caldera. Granite from this area ranges in color from shades of pink, gray, black, even a bluish tint. The variance in color designates the different ages of formation of the rock.
The mountains themselves were formed approximately 295 million years ago when two continents collided with one another and caused an uplift of land mass called the Ozark Dome. This uplift shifted the granite upward and formed the mountains.

A Great Sea

At one point in our geological history, all of what is now known as the "Old Lead Belt" was covered by a large sea. Approximately 520 million years ago, the sea began receding, leaving sand deposits in its wake. The sand deposits eventually formed rock. This rock, called, LaMotte Sandstone (named for the French explorer, Antoine de Lamothe Cadillac) is the oldest sedimentary rock in Missouri.

Some History Behind the Science

The Old Lead Belt, which includes Madison County, has recorded evidence of mineral exploration and mining from 1713 through 1972. European exploration reports and inhabitant history during the 1700's show evidence that the native tribes inhabiting the area gathered lead from rocks on the surface and engaged in

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Madison County Lead Health and Safety Science Curriculum Lead Science	SECTION: 5.3
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shallow mining efforts at the area European settlers named Mine LaMotte. In fact, trading efforts may have been going on between the Chickasaw Indians and French settlers soon after their settlement of the areas just east of the Mississippi River. Although there is evidence of native tribes smelting copper in the Southwest portions of the United States, there is, however, no evidence that native tribes smelted lead in this area. The natural resource used to build the fires necessary for smelting, both in early mining and in industrial mining was coal. The rock kit contains pieces of coal dug up during remediation efforts in the county. These coal chunks could have been used in the industrial smelting era between 1880 and 1960 or used as early as the 1700's in log smelting furnaces—the oldest method of smelting used in this area. These particular pieces were found at a site that contained evidence of the kind of shallow pit mining that occurred from the early mining era up through the 1940's.

Local Minerals and Metals

Minerals found in and around Madison County include galena (mined for lead), sphalerite (mined for zinc), chalcopyrite (mined for copper) and hematite (mined for iron). The metals silver, cobalt, manganese and gold (trace amounts) were also mined. At the turn of the century, Madison County was home to the only cobalt mine west of New York; it was one of only two that existed in the entire country.

Summation of lead health research

The latest science is showing us that there is no safe level of lead. The more people are exposed to lead, the more potential they have for absorbing lead into their bloodstream. Children are at highest risk because their bodies do not rid themselves of lead as easily as adults. Ages 0-6 comprise the highest risk category because these children more easily put things into their mouths. Ages 7-12 are the next highest risk category. Children ages 12 and up are the last risk category at this time. Pregnant woman are also considered at higher risk because their unborn children can be exposed to the lead their mother swallows or breathes. Absorbed lead will stay in the bloodstream for a few weeks. Some of the lead is naturally

excreted while the remaining lead is deposited in the body's soft tissues or absorbed into the bones. Presently, research is being conducted to study the impact of absorbed lead in older adults, particularly adults over the ages of 50 who have broken a bone.

Interesting Lead Health Facts

Most likely the first recorded regulation about lead health was enacted in the late 1600's in Germany. At that time a lead additive was put into wine to sweeten the taste. After finding several people sick and dying after consuming large quantities of wine, the rule was enacted that anyone putting the lead additive into the wine henceforth would be subject to death. If someone knew of another who was still putting in the lead and didn't tell community officials, that person was subject to death as well.

In 1821, just after Missouri became a state, legislation was enacted to help foster lead safety around smelting furnaces. French miners had discovered that their livestock were getting sick and dying when they were kept close to smelting furnaces, so they began putting up fences around their furnaces to separate them from their cattle and horses. The law enacted stated that a fence had to be erected at least ten feet from a furnace for the purposes of separating the furnace from the livestock area.

The following is an article published in "The News Democrat" (September, 2011). The article presents lead health and safety information as well as an introductory description of the Madison County Voluntary Institutional Controls Plan (VICP):

LEAD WASTE PROVEN A DANGEROUS FOE; EDUCATION KEY WEAPON IN FIGHT

By Laura Grindstaff and the Madison County Health Department

SUBJECT: Madison County Lead Health and Safety Science Curriculum Lead Science	PART: Voluntary Institutional Controls Education for School Children SECTION: 5.3
REFERENCES	EFFECTIVE: Revisions:

Madison County contains many different forms of lead. Lead in larger forms—lead sulfide, or galena, is not inherently dangerous to humans. Lead encased in rock form, known as galena, is not an inherent danger because the form is too large to easily ingest, thus having a low bioavailability to humans. However, several forms of lead existing in Madison County are dangerous. Because of their tiny sizes, lead paint flakes, chat and slime can easily be ingested by human beings. During the 300 year mining era, as large chunks of galena were milled and broken down into smaller pieces, the lead waste –slime and chat—became exposed to the atmosphere—wind, air, soil, water. Research shows that once the lead sulfide is exposed to the atmosphere, it begins to change chemically into lead sulfate, lead carbonate, lead oxide, and other forms. In addition to atmospheric exposure, the last 100 years of vehicle use has also contributed to the breakdown of lead particles. These broken-down forms are more easily inhaled or ingested by humans. In other words, lead waste is more bio-available than lead encased in rock, and the longer these forms are exposed to the pressures breaking them down, the more bio-available they become.

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Lead exposure, either swallowed or inhaled, is dangerous, particularly for pregnant women and children. Once lead particles have been eaten or breathed in, tissue in the body absorbs it. The body stores lead in bones; it can be there for decades. Lower levels of lead poisoning can damage the nervous system and the brain, interfere with growth, impact hearing, lower IQ, and in general, make learning more difficult. The same information explains that higher levels of lead poisoning can cause comas, convulsions, and even death.

The Agency for Toxic Substances and Disease Registry (ATSDR) reports that adults pass most (99%) of lead swallowed as waste within two weeks, but children only pass about a third of the lead swallowed (32%). The ATSDR information also states, pregnant woman are at risk because their unborn children can be exposed to the lead inhaled or ingested by the mother. Lead impacts to the baby are premature birth, low birth weight, decreased mental ability and learning difficulties and reduced growth as young children.

According to Madison County Health Dept. records, in 1996, two percent (2%) of an estimated population of 900 children less than six years of age had their blood tested for lead levels. Twenty-seven percent (27%) of the children tested

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Madison County Lead Health and Safety Science Curriculum Lead Science	SECTION: 5.3
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had higher than acceptable blood-lead levels. Additional testing in future years continued to show higher than acceptable results for blood-lead levels in children until lead paint flakes began to be removed from homes and health education was given to families, providing them with "best practices" to act in ways to lessen lead ingestion.

However, Madison County's lead pollution challenge involves a much broader set of issues than lead paint flakes. The designation of Madison County as a "Superfund Site" by the Environmental Protection Agency provided a good deal of resources to create health education initiatives so families can both help children already adversely impacted by lead poisoning and learn best practices to keep future poisoning from occurring. In addition, a voluntary institutional controls plan (VICP) was created in collaboration with county, state, and federal agencies to educate residents about the most current "best practices" to manage the spread of additional lead contamination in the soil. The VICP effort is the most extensive lead education initiative in Madison County history and is the next step in county-wide remediation actions. Once a property has been remediated, the

SUBJECT: Madison County Lead Health and Safety Science Curriculum Lead Science	PART: Voluntary Institutional Controls Education for School Children SECTION: 5.3
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VICP will educate residents how to manage their property in ways to lessen any future migration of lead contamination.

As Madison County residents begin their next 300 years of living with lead, the key to good health is to understand how lead waste can contaminate land, water, and air, and can be absorbed into the body. The more residents talk about their experiences with lead and work together using practices that reduce soil contamination and absorption opportunities, the healthier Madison County becomes.

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Rock and Lead Forms Kit Contents List	SECTION: 5.4
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: February 2014

Rock and Lead Forms Kit Contents List

DIRECTIONS: Although all lead forms are encased in either a plastic bag or glass jar, there is the possibility of small pieces of lead being transferred either to classroom furniture or directly on the hands of children. It is EXTREMELY important to clean up the activity area immediately following use and to have students wash their hands immediately following the activity. You are strongly encouraged to keep all lead forms encased at all times. When packing the case, you are encouraged to protect the glass jars from the rocks using some kind of softer packing material. A yearly cleaning of the box housing the materials is also recommended.

Non-Lead Rock Forms Important to Area:

1. One piece of pink granite—younger formation of granite from area's volcanic activity approx. 1.5 billion years ago
2. One piece of LaMotte Sandstone—formed from sand deposits after recession of great sea approx. 520 million years ago
3. One piece of transitional rock—some granite and some sedimentary rock or two different colors of granite rock, depending on your rock sample.
4. Several pieces of coal used when smelting lead in log furnaces. These furnaces were primarily used in the 1700's and early 1800's, but a few remained in use by individual families into the early 1900's. The age of these coal samples is not known. As the coal was found in soil containing lead contamination, you are strongly encouraged to keep the coal enclosed in its container.

Samples of Lead Forms

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Rock and Lead Forms Kit Contents List	SECTION: 5.4
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: February 2014

1. One piece of rock containing lead (gray colored areas), iron (red colored areas), and other minerals.
2. One jar containing smaller lead pieces. These were most likely waste materials from smelting processes older than 20th Century techniques.
3. One jar containing larger chat pieces along with soil. The amount of lead was not measured. These chat pieces came from mining processes used in the 20th Century.
4. One container of smaller chat pieces along with soil. The amount of lead was measured at 3,332 parts per million (ppm). Remediation activities in Madison County took place when surface soil contained more than 400ppm and was located around areas designated as residential, recreational, or play.
5. One container of chat from a driveway. The amount of lead measured at 5,545 ppm.

Lead Health and Awareness Experiments

NOTE: No lead in any form is used in either of these two experiments the way they have been written and originally intended for use. Using soil in Madison County for Experiment #2 is STRONGLY discouraged because the lead content may be unknown. Instead, please refer to the materials list and use as written.

EXPERIMENT #1: A Large Chunk of Lead vs. Small Particles of Lead—What are the Risks?

Materials List

Each team of two students needs: 2 "original" (not soft) chocolate chip cookies , one sealable sandwich bag, one small cup of water, two napkins. One large bowl to place the cookies in and three spoons are also needed.

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Rock and Lead Forms Kit Contents List	SECTION: 5.4
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: February 2014

Preparation Instructions

The instructor should place the cookies needed in the large bowl with the spoon to the side of it. The other items can be readied for the students to take back to their experiment area.

This experiment has two parts to it. Part One models, in general, how a mining company worked and will help the students respond to Question One below. Part Two measures the risk from lead between a large chunk and many small pieces and helps students respond to Question Two below. The experiment can be done as two separate parts on two separate days. However, it is most effective when both parts are done within the same week of class work.

Questions Posed

Question One: Lead waste can be found many places in south-eastern, south-central, and south-western Missouri, even places where there wasn't active lead mining. How did lead waste spread to such a large area?

Question Two: Which form of lead is usually considered most risky—a large chunk of lead or small pieces of lead?

Have the students form a hypothesis statement in response to each question, and provide an explanation for each hypothesis statement.

Part One Conclusions

At the end of Part One, the class should state out loud their supply choices. The teacher can show the results on an overhead or smart board. Did the teams choose the same locations and uses, or did they choose differently? Use observations of the teams' choices to answer why lead waste could have been spread so far and wide, even where there was no active mining.

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Rock and Lead Forms Kit Contents List	SECTION: 5.4
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: February 2014

Part Two Conclusions

Knowing that lead is poisonous when enough of it is either swallowed or breathed by humans, what are the conclusions about the health risk of a large chunk of lead versus small particles of lead. In order for students to answer, have them check observations for Part Two, Steps 1, 2, and 3 recorded on the data sheets and write down their conclusions on their data sheet.

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
How a Mining Company Works and Impacts the Spread of Lead Waste	SECTION: 5.5
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: January 2014

PART ONE: How a Mining Company Works and Impacts the Spread of Lead Waste

Student Directions

Pretend you are a mining company. There are four steps your company must take in order to be successful—picking a site for your company and acquiring your tools, mining the lead, processing the lead, and supplying the lead and its waste products to people.

Step One—Picking a Site and Acquiring Tools

Before you can start the mining, you need to pick your work site and gather your company's tools. Locate your work site first, and then send one teammate for the following tools: one sandwich bag, one small cup of water, and two napkins.

Step Two—Mining for Lead

Now that you have your work site and tools, it's time to begin mining! One teammate will take a spoon and mine two large chunks of lead (each cookie represents a chunk of lead). Be careful not to break the chunks. That will mean a loss of profit for your company! When you have the four chunks of lead, bring them back to your work site to begin processing.

Step Three—Processing the Lead

Set one of the chunks of lead aside on a napkin; you will use them later. Place the remaining chunk in the sandwich bag and seal it tightly. Make sure the seal is closed all the way. Using your hands, carefully crush the cookie until it becomes small crumbs inside the bag. Be careful not to rip or tear the bag. When lead ore was processed in the smelters, two products resulted, lead and lead waste. The crushed cookie now represents lead waste.

Step Four—Supplying Lead and Lead Waste to People

The area you live in once supplied most of the whole world's need for lead! Lead from Madison County went all over the United States, to Europe, to Africa, and to South America. On your data sheet, circle the continent your company would

choose to transport your lead to. (There is no wrong answer. Make your own company choice; don't talk to other teams)

Lead waste went to many different places all over the United States as well. It was used like sand. People used it to make roadways and driveways. People used it in parks and play areas. People mixed it with their soil when farming as a nutrient for their crops. On your data sheet, circle the location and use your company would choose for your lead waste. (There is no wrong answer. Make your own company choice; don't talk to other teams.)

After awhile, lead was found to be poisonous to humans if they swallowed or breathed in enough of it. So, lead and lead waste stopped being used in some of the ways it had been used before.

SUBJECT: Analyzing the Risks from Lead in Large and Small Pieces	PART: Voluntary Institutional Controls Education for School Children SECTION: 5.6
REFERENCES	EFFECTIVE: October 1, 2012 Revisions: September 11, 2012

PART TWO: Analyzing the Risks from Lead in Large and Small Pieces

Analysis

Step One

Lead is taken in the human body in two different ways, by breathing it in and by swallowing it. Pick up your whole cookie (chunk of lead) and observe. How easy would it be to breathe the whole cookie in? How easy would it be to swallow the whole cookie? (DO NOT ATTEMPT TO SWALLOW THE COOKIE WHOLE!) Respond to these questions on your data sheet.

Now take the bag of cookie crumbs (small lead and waste particles). Ask the same questions. How easy would it be to breathe in a few of these particles? How easy would it be to swallow these particles whole? Respond with your observations on your data sheet. From your observations respond to this question: Which would be easier to swallow, a large chunk of lead or small pieces of lead?

Step Two

Lead in the air can be more easily breathed in than lead particles on the ground. Place the whole cookie on a napkin and blow at it. How easy is it to blow the cookie and move it to another place on the napkin? Mark you observations on your data sheet. Take some of the crumbs from your sandwich bag and place them onto the other napkin. Blow at the crumbs. How easy is it to blow the crumbs and move them to another place on the napkin? Mark your observations on your data sheet. From your observations respond to this question: Which would be easier for the wind to move through the air, a large chunk of lead or small particles of lead?

Step Three

Lead stuck on clothes or on the body can more easily reach the mouth and nose than lead on the ground. Wet two fingers in the cup of water and try to pick up the whole cookie. Were you able to "stick" the cookie onto your body? Record your observations on your data sheet. Next, use two different fingers and wet them in the cup of water. Try picking up some of the crumbs inside the sandwich bag.

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Analyzing the Risks from Lead in Large and Small Pieces	SECTION: 5.6
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Were you able to "stick" the crumbs onto your body? Record your observations on your data sheet. From your observations, respond to this question: Which would be easier to stick to the body if the body is wet, a large chunk of lead or small particles of lead?

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Student Data Sheet	SECTION: 5.7
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: January 2014

Name:_____ Date:_____

EXPERIMENT #1: A Large Chunk of Lead vs. Small Particles of Lead—Which is Worse and Why?

Hypothesis

State your hypothesis about which is worse—a large chunk of lead or many small particles of lead. Explain why you think the way you do.

Conclusions for Parts One and Two to be Finished After Reporting Observations

Question One: Lead waste can be found many places in south-eastern, south-central, and south-western Missouri, even places where there wasn't active lead mining. How did lead waste spread to such a large area?

Question Two: Which form of lead is usually considered most risky—a large chunk of lead or small pieces of lead?

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Student Data Sheet	SECTION: 5.7
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: January 2014

Name:_____ Date:_____

PART ONE: Circle choice for supplying lead

Southern United States England French African Colonies

Spain Mexico Western United States

English African Colonies English Colonies in Middle East

Eastern United States Argentina Germany

Circle choice for supplying lead waste:

Arkansas for building roads Missouri for play sand

Kansas for railroads Tennessee for building roads

Missouri for farm use Arkansas for railroads

Name:_____ Date:_____

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Student Data Sheet	SECTION: 5.7
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: January 2014

PART TWO

Step One

Lead is taken in the human body in two different ways, by breathing it in and by swallowing it. Pick up your whole cookie (chunk of lead) and observe. How easy would it be to breathe the whole cookie in? How easy would it be to swallow the whole cookie? (DO NOT ATTEMPT TO SWALLOW THE COOKIE WHOLE!) Respond to these questions on your data sheet.

Now take the bag of cookie crumbs (small lead and waste particles). Ask the same questions. How easy would it be to breathe in a few of these particles? How easy would it be to swallow these particles whole? Respond with your observations on your data sheet. From your observations respond to this question: Which would be easier to swallow, a large chunk of lead or small pieces of lead?

Observations about a Large Chunk of Lead

Observations about Small Particles of Lead

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Student Data Sheet	SECTION: 5.7
REFERENCES	EFFECTIVE: October 1, 2012
	Revisions: January 2014

Name:_____ Date:_____

Step Two

Lead in the air can be more easily breathed in than lead particles on the ground. Place the whole cookie on a napkin and blow at it. How easy is it to blow the cookie and move it to another place on the napkin? Mark you observations on your data sheet. Take some of the crumbs from your sandwich bag and place them onto the other napkin. Blow at the crumbs. How easy is it to blow the crumbs and move them to another place on the napkin? Mark your observations on your data sheet. From your observations respond to this question: Which would be easier for the wind to move through the air, a large chunk of lead or small particles of lead?

Observations about a Large Chunk of Lead

Observations about Small Particles of Lead

SUBJECT: Student Data Sheet	PART: Voluntary Institutional Controls Education for School Children SECTION: 5.7
REFERENCES	EFFECTIVE: October 1, 2012 Revisions: January 2014

Name:_____ Date:_____

Step Three

Lead stuck on clothes or on the body can more easily reach the mouth and nose than lead on the ground. Wet two fingers in the cup of water and try to pick up the whole cookie. Were you able to "stick" the cookie onto your body? Record your observations on your data sheet. Next, use two different fingers and wet them in the cup of water. Try picking up some of the crumbs inside the sandwich bag. Were you able to "stick" the crumbs onto your body? Record your observations on your data sheet. From your observations, respond to this question: Which would be easier to stick to the body if the body is wet, a large chunk of lead or small particles of lead?

Observations about a Large Chunk of Lead

Observations about Small Particles of Lead

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Lead Health and Awareness Experiments	SECTION: 5.8
REFERENCES	EFFECTIVE:
	Revisions: January 2014

Lead Health and Awareness Experiments

NOTE: No lead in any form is used in either of these two experiments the way they have been written and originally intended for use. Using soil in Madison County for Experiment #2 is STRONGLY discouraged because the lead content may be unknown. Instead, please refer to the materials list and use as written.

EXPERIMENT #2: Digging in Soil Containing Lead—Finding a Better Way

Introduction

This experiment will show students one kind of remediated soil condition now present in Madison County. It will also give them an opportunity to figure out ways to dig in contaminated soil that decrease the spread of contamination versus ways that could potentially increase the spread of contamination. They also will come to understand the digging practice encouraged by the Madison County Voluntary Institutional Controls Plan (VICP).

Materials List

Each team of three students needs: one large disposable cup, preferably clear filled with soil and sand according to the preparation directions, one plastic spoon, and two plastic sandwich bags. The cup filling materials are listed in the preparation directions below.

Preparation Instructions

The following materials are needed for filling up the cup: Soil, sand, one penny for each cup, a box of plastic wrap. Before the experiment can be conducted, the instructor needs to fill one cup per team with a soil and sand combination. **It is important to use soil and sand purchased from a local store, not local soil or sand dug as these materials could be contaminated with lead.** Each cup of

"lead" should be filled with sand from the bottom to the halfway mark. Place a penny in this sand at some point during the filling process. Once the penny has been buried, and the sand has reached the halfway mark of the cup, cover the sand with plastic wrap. Next, fill the rest of the cup with soil. This filled cup represents many remediated yards in Madison County. The top two feet of contaminated soil was replaced with clean fill, but the soil under the top two feet still contains lead contaminants. To demarcate the clean fill from the contaminated soil, there is a plastic orange mesh. The sand in the cup represents the contaminated soil. The soil represents the clean fill. And the plastic wrap represents the orange meshing. Once the cups have been filled, set them out along with the other materials to ready them for students' use.

Questions Posed

Question One: List the steps you took when trying to dig out your penny without mixing the clean fill with the contaminated soil.
Question Two: What problems did you encounter along the way?
Question Three: Would you do anything differently if you did the experiment a second time?
Question Four: Who were your team members? What did each of you do to participate in the experiment?

Conclusions

At the end of the experiment students should be able to state how to dig out the penny in a way that does not mix the sand and soil. The teacher can then assist students in comparing the Voluntary Institutional Controls Plan "best practices for digging" with the students' findings. The comparison should show many similarities between the students process of digging and the stated "best practices".

To Begin the Experiment

To introduce students to the experiment, ask each team to carefully take a cup, a spoon, and two plastic bags back to their work space. Remind them that for the experiment to work properly, their cup cannot be spilled or bounced around too much. Talk with them about the EPA remediation that has taken place in the

SUBJECT:	PART: Voluntary Institutional Controls Education for School Children
Lead Health and Awareness Experiments	SECTION: 5.8
REFERENCES	EFFECTIVE:
	Revisions: January 2014

county. Go over the fact that exposure to lead can be harmful, and that a good amount of soil in Madison County has lead in it. Much of the time, the lead looks similar to soil, so you can't always tell if lead is in the soil by just looking. In order to keep people from being exposed to the lead in the soil, "clean fill", soil, without all the lead contamination was put on top of some of the lead contaminated soil around people's homes. Present to them the challenge: People still have to dig in their dirt sometimes. They dig basements, sewer lines, gardens, fence post holes, and wells, among other things. How can people dig without mixing the contaminated soil with the clean fill?

SUBJECT: Student Data Sheet: Lead Health and Awareness Experiments	PART: Voluntary Institutional Controls Education for School Children SECTION: 5.9
REFERENCES	EFFECTIVE: Revisions:

Name:_____ Date:_____

DATA SHEET—Page One

EXPERIMENT #2: Digging in Soil Containing Lead—Finding a Better Way

Challenge Posed

Your cup represents a remediated yard. The bottom half of the cup contains sand (contaminated soil), and the top half contains soil ("clean" fill). There is a penny buried somewhere in the contaminated soil. Using only the materials in front of you-- a spoon and two plastic bags--how can you dig out the penny without mixing the contaminated soil with the clean fill. You will find a piece of plastic in your cup, separating the clean soil from the sand. When you are finished digging out the penny, replace the soil the way you found it, contaminated in the bottom, clean fill on the top, with the plastic separating the two. List your steps below, and respond to the other questions.

Hypothesis

Before starting to dig, write down the process you think will allow you to dig the penny out without mixing the sand and soil together.

SUBJECT: Student Data Sheet: Lead Health and Awareness Experiments	PART: Voluntary Institutional Controls Education for School Children SECTION: 5.9
REFERENCES	EFFECTIVE: Revisions:

Observations

1. List the steps you took when trying to dig out your penny without mixing the clean fill with the contaminated soil.

2. What problems did you encounter along the way?

3. Would you do anything differently if you did the experiment a second time?

4. Who were your team members? How did each of you participate in the experiment?

SUBJECT: FOR THE INSTRUCTOR TO SHARE WITH THE STUDENTS AFTER THE EXPERIMENT IS FINISHED	PART: Voluntary Institutional Controls Education for School Children SECTION: 5.10
REFERENCES	EFFECTIVE: Revisions: January 2014

FOR THE INSTRUCTOR TO SHARE WITH THE STUDENTS AFTER THE EXPERIMENT IS FINISHED

According to the Madison County Voluntary Institutional Controls Plan (VICP), the best practices encouraged for digging in the scenario represented by this experiment are as follows:

If the surface soil at your dig site is "clean fill", but under the surface, the soil is contaminated:

A. Dig "clean fill" soil until the visual demarcation. Do not dig under the barrier.
B. Keep all surface "clean" fill separate from the contaminated soil.
C. Dig under the visual demarcation to desired depth, placing all this contaminated soil on plastic sheeting or another suitable temporary barrier, separate from the clean fill.
D. Once object is placed in hole, fill hole with contaminated soil up to the visual demarcation depth.
E. Replace visual demarcation on top of contaminated soil.
F. Fill in the remaining hole with the surface clean fill.

The best practices also encourage the following:

Proper cleanup after digging:

A. Wash all tools to rid them of contaminated soil. DO NOT wash in an area that has been remediated.
B. Take shoes off before entering the inside of your home. Wash clothes separately from other clothes. Non-washable shoes should be cleaned with a damp cloth.
C. Dispose of plastic sheeting or other temporary barrier materials in a covered trash receptacle. Take care not to spill or drop soil off sheeting or other barrier materials. This way soil cannot re-contaminate the ground.

SUBJECT: FOR THE INSTRUCTOR TO SHARE WITH THE STUDENTS AFTER THE EXPERIMENT IS FINISHED	PART: Voluntary Institutional Controls Education for School Children SECTION: 5.10
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Wrap-Up Discussion

Ask students how their digging process compared to the VICP "best practices for digging".

What were the similarities? What were the differences?

If the students' process differed from the "best practices", discuss why the VICP processes suggest the practices they do.

Ask students why using these cleanup steps would be important. Their responses should indicate some understanding that tools and clothes/shoes can carry remnants of the contaminated soil, so that soil needs to be disposed of in a way that doesn't spread the contamination.

SUBJECT:	PART: Pamphlets
Cover Page	SECTION: 6.0
REFERENCES	EFFECTIVE:
	Revisions: October 2013

Madison County Voluntary Institutional Controls Manual

Section 6 Pamphlets

Resources:

EPA

913-551-7603

Madison County Health Department

573-783-2747

Missouri Department of Natural Resources (Southeast Regional Office Poplar Bluff, MO)

573-840-975

** If your property has not been tested and/or remediated, you are encouraged to contact the EPA for testing and remediation options **

Revised March 2014

Help Reduce Soil Lead Contamination!

This brochure is brought to you by Madison County. For information about obtaining copies of this brochure contact the Madison County Health Department.

Madison County Health Department

806 W. College
Fredericktown, MO 63645

Phone: 573-783-2747
Website: http://madisoncountyhealth.us/

Voluntary Institution Controls Plan Educational Pamphlet

BEFORE YOU DIG

What is VICP?

Lead is a part of our lives in Madison County, partially because of the unique geological qualities of our land and partly due to 300 years of mining and processing that occurred within our county. Because of the amount of lead found within our land, in 2003 our county was listed on the EPA's National Priorities List of contaminated sites.

EPA has spent several years testing and remediating or cleaning up residential properties within the county. Now, we have developed a Voluntary Institutional Controls Plan (VICP) in an effort to have a plan for the control and prevention of lead soil contamination.

Lead is poisonous and can create ill health effects in both children and adults when ingested. The Madison County VICP strives to reduce lead health risks by providing "best practices" to effectively manage lead contamination and prevent migration. The ultimate goal of the VICP is to reduce human exposure to lead contaminants within the soil.

Facts to Know Before You Start a Digging Project:

- **If you dig on a residential property, including your own, you are responsible for managing the soil in a way that does not spread lead contamination.**
- **The EPA will NOT come in and remediate property that has been re-contaminated after they have already completed the remediation process.** Property clean up will become the responsibility of the property owner and potentially any individual or company who commercially participated in the digging, hauling and disposal of contaminated soil.
- **It is important to understand how state and federal regulations apply to hauling and disposal of contaminated soil.** IMPROPER HAULING OR DISPOSAL OF CONTAMINATED SOIL IS ILLEGAL.
- **Follow "Best Practices" outlined in the VICP manual, to minimize the potential for spreading lead contamination when digging, hauling, or disposing of soil.** The VICP manual can be found at the Madison County Health Department, Ozark Regional Library, or at the health department's website, http://madisoncountyhealth.us/ . The website will contain the latest updates.

DIG RIGHT! HAUL RIGHT! DUMP RIGHT!

Steps To Take Before You Dig:

- **Call Missouri One Call (1-800-344-7483).** Call before beginning ANY digging project. This action will notify the VICP representative at the health department, who can assist you further with best practices for digging, hauling, and disposal of project soil.
- **Know soil conditions at the dig site.** If your property was tested or remediated, you should have a property record that contains this information. If you do not know your soil conditions, you can call the VICP representative at the Madison County Health Dept (573-783-2747) for assistance.
- **Understand "best practices" appropriate for your specific digging project.** Refer to the VICP manual and/or the VICP representative at the health department can assist.
- **Understand state and federal regulations regarding hauling and disposal of soil.** The VICP representative at the health department can screen remaining project soil upon request and recommend best practices for soil hauling/disposal.

Resources:

EPA

913-551-7603

Madison County Health Department

573-783-2747

Missouri Department of Natural Resources (Southeast Regional Office Poplar Bluff, MO)

573-840-975

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Revised March 2014

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Madison County Health Department

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Fredericktown, MO 63645

Phone: 573-783-2747
Website: http://madisoncountyhealth.us/

Voluntary Institution Controls Plan Educational Pamphlet

DISPOSAL/ HAULING SOIL IN MADISON COUNTY

Disposal/Hauling Soil In Madison County

The Madison County Voluntary Institutional Controls Plans (VICP) strives to reduce lead health risks by providing "best practices" to effectively manage lead contamination and prevention of the migration of lead contamination. The ultimate goal of the VICP is to reduce human exposure to lead contaminants within the soil. To reach this goal, it is important that "best practices" are not only followed when digging, but also while disposing and hauling soil in Madison County.

The Department of Natural Resources regulates the hauling and disposal of contaminated soils. The standard of 400 parts per million (ppm) lead or less has been established as a satisfactory soil lead content in Madison County. **Any soil containing over 400 ppm lead is considered contaminated and has specific regulations for hauling and disposal. Soil containing 1500 ppm lead or greater is considered hazardous waste and also has specific regulations for hauling and disposal.**

Facts About Disposal/Hauling Soil In Madison County:

- **State and federal regulations do apply when hauling and disposing contaminated/hazardous soil.** IMPROPER HAULING OR DISPOSAL OF CONTAMINATED SOIL IS ILLEGAL.
- **A property owner or contractor can potentially be held responsible for any migrating soil contamination caused by improper hauling or disposal of contaminated/hazardous soil.**
- **It is recommended that all excavated contaminated soil in Madison County be hauled to the Madison County repository site.**
- **Hazardous soil should only be hauled by a licensed hazardous waste hauler.**
- **Follow "Best Practices" outlined in the VICP manual, to minimize the potential for spreading lead contamination when digging, hauling, or disposing of soil.** The VICP manual can be found at the Madison County Health Department, Ozark Regional Library, or at the health department's website, http://madisoncountyhealth.us/ . The website will contain the latest updates.

DIG RIGHT! HAUL RIGHT! DUMP RIGHT!

Steps To Take Before Disposing/Hauling Soil In Madison County:

- **Know the lead content of the soil being disposed of or hauled.** DNR normally requires soil to be tested by a laboratory. However, ONLY IN MADISON COUNTY, AS PART OF THE VICP, the DNR is allowing the use of an XRF as a testing method. Soil testing above 1500 ppm lead will be considered hazardous materials and must be transported by a licensed hazardous waste hauler. Soil testing below 1500 ppm lead may be transported to the county repository site as long as VICP best practices are followed. If the soil conditions of remaining project soil are unknown, you can call the VICP representative at the Madison County Health Dept (573-783-2747) for assistance. The VICP representative can screen the soil using an XRF and then provide recommendations for disposal or hauling soil.
- **Understand "best practices" for the hauling/disposing of soil at the specific site.** Refer to the VICP manual and/or the VICP representative at the health department can assist.

Resources:

EPA

913-551-7603

Madison County Health Department

573-783-2747

Missouri Department of Natural Resources (Southeast Regional Office Poplar Bluff, MO)

573-840-975

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Revised March 2014

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Voluntary Institution Controls Plan Educational Pamphlet

HEALTHY GARDENING PRACTICES

General Information

Lead is a part of our lives in Madison County partially because of the unique geological qualities of our land and partly because of mining waste left behind from 300 years of mining operations. We are striving to minimize the impacts of the lead on our land and manage it in healthy ways. The Voluntary Institutional Controls Plan (VICP) is a management plan created by Madison County which contains "best practices" for the control and prevention of lead soil contamination.

Best practices should be used when developing a gardening area as lead contamination in a garden area has potential for creating health risks. Some fruits and vegetables can absorb lead contained in soil. The lead can then be absorbed into the body when those fruits and vegetables are consumed. Children, pregnant women, and unborn children are at highest risk for the absorption of lead.

Steps To Follow Before Developing a Garden Area:

- **Know the soil conditions of the garden area.** If you do not know the soil conditions, you can call the VICP representative at the health department (573-783-2747) for assistance.
- **If the garden area is located on property that has already been remediated by the EPA, it will be suitable for gardening.**
- **If the garden area is located on property that has not been tested or remediated, it may not be suitable for gardening.** You should use 24 inches of clean fill (soil containing 240 parts per million or less lead) to cover the gardening area before planting.

DIG RIGHT! HAUL RIGHT! DUMP RIGHT!

Resources for Lead Soil Management:

- **Refer to the VICP manual before starting any digging project.** The VICP manual can be found at the Madison County Health Department, Ozark Regional Library, or the health department's website: http://madisoncountyhealth.us/.
- **The VICP representative at the health department can assist you with digging, hauling, and disposal questions.** The VICP representative can access property database records, update your property record, and recommend best practices.
- **Lead health information can be obtained at the Madison County Health Department.**

Resources:

EPA

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Madison County Health Department

573-783-2747

Missouri Department of Natural Resources (Southeast Regional Office Poplar Bluff, MO)

573-840-975

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Madison County Health Department

806 W. College
Fredericktown, MO 63645

Phone: 573-783-2747
Website: http://madisoncountyhealth.us/

Voluntary Institution Controls Plan Educational Pamphlet

PURCHASING OR RENTING PROPERTY

General Information

Madison County is located in the St. Francois Mountains which creates a beautiful landscape of rolling farmland and heavily wooded areas filled with natural wildlife. Madison County is located within what is known as the "old lead belt", an area known for rich lead ore deposits. Mining operations supported our ancestors and are an important part of history of our county.

However, the mining operations have created a challenge, as mine waste left behind in some areas contains elevated levels of lead. Madison County has taken positive steps to overcome this challenge. In 2003, EPA started remediating (cleaning up) contaminated soil on residential properties in the county. Furthermore, Madison County has developed a plan to minimize and manage lead contamination on our land. The management plan, called The Voluntary Institutional Controls Plan (VICP), contains "best practices" for the control and prevention of lead contamination.

Madison County is proud of it's land and all it's natural beauty and strives to keep improving the quality of our land, health and environment.

Questions to Ask Before Purchasing/Renting Property:

- **Was the home built before 1978? If so, does the paint contain lead?**
- **Has the property been tested for soil lead content?**
- **What is the soil lead content?**
- **Has the property been remediated so that it contains a satisfactory lead level?**
- **If remediated, does the property contain a visual demarcation between the remediated soil and contaminated soil?**
- **If remediated, has any excavation, construction, or renovation taken place on the property since the remediation?**
- **Have soil management "best practices" been used on the property?**

DIG RIGHT! HAUL RIGHT! DUMP RIGHT!

After the Purchase or Rental:

- **Is the property record available and update?**
- **If soil conditions at the property are unknown, you can call the VICP representative at the Madison County Health Department for assistance (573-783-2747).**
- **If the property has not been tested or remediated, you are encouraged to contact the EPA for testing and remediation options.**
- **For any renovation or digging projects, follow "best practices" outlined in the VICP manual.** The VICP manual can be found at the Madison County Health Department, Ozark Regional Library, or at the health department's website: http://madisoncountyhealth.us/. The website will contain the latest edits and updates.

Resources:

EPA

913-551-7603

Madison County Health Department

573-783-2747

Missouri Department of Natural Resources (Southeast Regional Office Poplar Bluff, MO)

573-840-975

** If your property has not been tested and/or remediated, you are encouraged to contact the EPA for testing and remediation options **

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Help Reduce Soil Lead Contamination!

This brochure is brought to you by Madison County. For information about obtaining copies of this brochure contact the Madison County Health Department.

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Private Water Contamination

General Information

Private water sources can be contaminated by bacteria and/or metals. Some metals, such as fluoride, lead and iron, occur naturally in water sources. A hazardous level of metals or bacteria in a water source could cause detrimental health effects when consumed.

Water contamination can occur after a natural disaster such as a flood or tornado. Natural disasters can damage water systems or submerge them creating contamination. Furthermore, contamination in water can occur any time there is damage to the water system such as a broken water line or cracked well head or casing.

Lead contamination in water can be found in older homes built or remodeled before 1970. The plumbing in older homes was often constructed from copper pipes and lead solder. Lead contaminants in piping can be transferred to water as it travels through the piping.

If you suspect your water contains contamination, it is important to take the appropriate steps to have it tested. If dangerous levels of bacteria or metals are found then you should take the proper action to eliminate the consumption of the contaminants to protect you and your family's health.

When Should Private Water be Tested:

- **A newly dug well.**
- **If your private water source has been damaged or affected by a natural disaster (Example: submerged with flood waters).**
- **Any damage to your water source such as broken water lines or cracked well casing has occurred.**
- **Unexplained illnesses occur in the home that are consistent with symptoms of water contamination.**

Testing:

- **Private water testing is available at the Madison County Health Department.**
- **Testing available includes new well series test and total metals test. These tests include results of both metals and bacteria levels.**
- **For questions, you can contact the Environmental Health Specialist at the Madison County Health Department at 573-783-2747.**
- **The Madison County Health Department is unable to provide water sampling and testing for residents with a public water supply.** Public water systems are managed and controlled by the owning entity (Ex: City of Fredericktown) and governed by the Department of Natural Resources.

Treatment Options:

- **Treatment recommendations for private water systems containing bacteria include disinfecting the water source.** Disinfecting instructions can be located at the Missouri Department of Health website, http://health.mo.gov.
- **The treatment recommendations for metal contamination in private water systems is to contact a reputable water softening company to determine what filters or other treatment options will be appropriate for the specific contamination.**
- **If lead contamination is occurring in the water source from old piping, it is recommended to replace the water piping system so that it contains no lead materials.**
- **For questions, call the Environmental Health Specialist at the Madison County Health Department.**